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ABSTRACT

This report deals with the supply of and demand for elementary and secondary school teachers in the United States, using data from the Schools and Staffing Survey of the National Center for Education Statistics. There is considerable concern over whether the United States will experience shortages of teachers in the coming years as student enrollments rise and demand for teachers increases. In 1990-91, the year of the survey, there were multiple and diverse sources of new teachers, including re-entrants into teaching. Over half of all secondary school teachers had master's degrees, but many taught in areas other than the one in which they had trained, with out-of-field teaching especially common in private schools. This analysis focuses on the levels of training teachers had in the subjects they taught, based on the premise that adequate staffing requires teachers at the high school level to hold at least a college minor in the fields they teach. Most of the newly hired were teachers who had moved or transferred from other schools. Between 1990-91 and 1991-92, there was an overall teacher turnover rate of 13%. Fifty-five percent of those who left, left teaching altogether. Ten tables and six figures in the text display survey findings. An appendix contains standard errors for six of the text tables. (Contains 75 references.) (SLD)

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Teacher Supply, Teacher Qualifications, and Teacher Turnover: 1990–91

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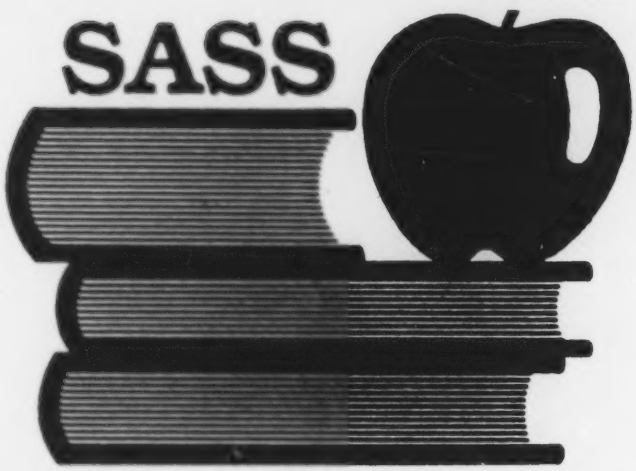

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Executive Summary

This report is concerned with the supply of and demand for elementary and secondary school teachers in the United States. Over the past decade, teacher supply and demand have been topics of increasing concern, uncertainty, and controversy among education researchers and policymakers. Concern surrounds the question of whether the United States will experience shortages of teachers in the coming years as student enrollments rise and demand for teachers increases. Uncertainty surrounds the factors that lead to shortages in the supply of teachers. Controversy surrounds the problem of how to ensure an adequate quantity of available teachers without sacrificing quality. Until recently, however, education researchers have been hampered by a lack of data in their efforts to clarify and resolve these issues.

In order to address these and other issues concerned with the staffing, occupational, and organizational aspects of schools, in the late 1980s the National Center for Education Statistics (NCES) conceived and conducted the Schools and Staffing Survey (SASS)—a major national survey of teachers and schools. This report analyzes and reports data from the 1990-91 SASS on three topics.

- Sources of teacher supply
- Qualifications of the high school teaching workforce
- Teacher turnover

Selected results of the analyses are summarized below.

Sources of Teacher Supply

What are the major sources of supply for the elementary and secondary teaching force?

The sources of new elementary and secondary school teachers in 1990-91 were multiple and diverse. About 338,000 teachers were newly hired just before or at the start of the 1990-91 school year, representing 13 percent of the elementary and secondary teaching workforce. Only 18 percent of the newly hired came directly from colleges and universities, and 8 percent came from nonteaching jobs within the field of education. Nine percent of the newly hired came from noneducation occupations, and 6 percent came from the ranks of full-time parents or family caregivers. Many of these newly hired teachers were re-entrants (former teachers who were returning). Many were delayed entrants (trained teachers who did not seek a position immediately after their schooling). However, by far the largest source of hires was the school system itself; fifty-one percent of the newly hired were "movers"—those who transferred or migrated from teaching positions in other schools (figure 1.1).

Qualifications of the High School Teaching Workforce

What are the education and training levels of the high school teaching force (grades 9-12)? How well do high school teachers' qualifications match the assignments in which they are placed?

This analysis focuses on the levels of training teachers had in the subjects they taught, based on the premise that adequate staffing requires teachers at the high school level to hold at least a college minor in the fields they teach. Knowledge of subject matter does not, of course, guarantee quality teaching, or even qualified teachers. The premise is that subject knowledge is a necessary, but not sufficient, requirement of qualified teachers. Given this premise, this analysis indicates that in 1990-91, many teachers at the high school level taught classes for which they did not have adequate educational qualifications. This underqualified teaching was, however, not due to a lack of basic teacher education or training. The source of underqualified teaching is found in the fit between teachers' fields of training and their teaching assignments.

In 1990-91, almost all teachers at the high school level had received a college education. Ninety-nine percent of teachers at the high school level held a bachelor's degree. Moreover, a majority had obtained graduate degrees. Fifty-three percent of public high school teachers and 48 percent of private high school teachers held a master's degree or more (tables 2.1 and 2.2). Moreover, almost all teachers (96 percent) at the high school level in public schools had obtained formal training in teaching methods and pedagogical skills. That is, they had obtained a regular or standard state-approved teaching certificate. A smaller proportion of private school teachers (60 percent) at the high school level held regular state-approved certification.

However, many teachers at the high school level were assigned to teach classes in fields that did not match their educational background. That is, many teachers were assigned to teach subjects in which they did not have at least a college minor in the field, broadly defined. As a result, substantial numbers of students received their education from out-of-field teachers. For instance, 32 percent of all teachers who taught one or more classes in *mathematics* did not have at least a minor in mathematics or mathematics education (tables 2.3 and 2.4). As a result, 21 percent of all high school mathematics students, or about 2,678,000 of 12,666,000 students, were taught mathematics by out-of-field teachers (table 2.6).

Twenty-three percent of all those who taught one or more classes in *English* did not have at least a minor in English, literature, communications, speech, journalism, English education, or reading education (tables 2.3 and 2.4). As a result, 15 percent of all high school English students, or about 2,246,0000 of 15,234,000 students, were taught English by out-of-field teachers (table 2.6).

Nineteen percent of all those who taught one or more classes in *science* did not have at least a minor in any of the sciences or in science education (tables 2.3 and 2.4). As a result, 11 percent of all high school science students, or about 1,202,000 of 10,700,000 students, were taught by out-of-field teachers (table 2.6).

Nineteen percent of all those who taught one or more classes in *social studies* did not have at least a minor in any of the social sciences, in history, in public affairs, or in social studies education (tables 2.3 and 2.4). As a result, 11 percent of all high school social studies students, or about 1,357,000 of 12,400,000 students, were taught social studies by out-of-field teachers (table 2.6).

Different types of teachers differed distinctly in their out-of-field teaching levels. In particular, recently hired teachers in both public and private schools were more often assigned to teach out of field in many fields (figure 2.1).

Levels of out-of-field teaching also varied greatly across different types of schools. Public schools with a greater proportion of poverty-level students (i.e., those with over 50 percent of students receiving the federal free or reduced-price lunch program) had higher levels of out-of-field teaching in many fields than did schools with less than 20 percent poverty-level students (figure 2.2). However, school size was also an important factor; small public schools (with fewer than 300 students) had distinctly higher levels of out-of-field teaching in many fields than did large public schools (with 600 or more students) (figure 2.3).

Private schools showed particularly wide variations in levels of out-of-field teaching at the high school level, and school size was also an important factor. Smaller private schools had higher average levels of out-of-field teaching than did other private schools. On the other hand, larger private schools had among the lowest levels of out-of-field teaching of any schools (figure 2.3).

Teacher Turnover

What are the primary destinations of teachers exiting teaching positions? What kinds of schools have the highest levels of teacher turnover? What characteristics of schools are associated with teacher turnover?

Turnover, or the rate at which teachers exit schools, is multifaceted—consisting of both teacher migration (i.e., "movers"—those who transfer or migrate to teaching positions in other schools) and teacher attrition (i.e., "leavers"—those who leave teaching altogether). Teacher turnover is a significant phenomenon; it accounts for a large portion of both shifts in the quantity of demand for new teachers and changes in the quantity of teachers supplied. Between the 1990-91 and 1991-92 school years, about 383,000 elementary and secondary teachers exited their teaching positions—a turnover rate of 13 percent. Fifty-five percent of those who exited were movers, while 45 percent were leavers (figure 1.1).

The destinations of those exiting were diverse. Of those who left teaching altogether, 27 percent retired, 19 percent went to other (noneducation) jobs, 19 percent became full-time parents or family caregivers, 13 percent left for nonteaching jobs within the field of education, and 8 percent entered college or university programs (figure 1.1).

Cross-sector moves were particularly noteworthy. Public to private school moves represented a far smaller portion of employed public school teachers than private to public transfers did of private school teachers. Forty-six percent of those who moved from private school jobs moved to public schools. In contrast, only 5 percent of movers from public school jobs moved to private school jobs (figure 1.1).

Some types of schools had distinctly higher rates of turnover than other types. In particular, school sector and school size were distinctly related to turnover rates. Teacher turnover rates in private schools were, on average, almost twice that of public schools (16 percent to 9 percent) (figure 3.2). Small private schools (with fewer than 300 students) had, on average, 17 percent turnover. Large public schools (with 600 or more students) had, on average, 8 percent teacher turnover (figure 3.2). On the other hand, neither urban public schools nor public schools serving high poverty-level student populations had substantially higher teacher turnover rates than did other public schools (table 3.3).

Some aspects of the working conditions and environments in schools were related to turnover and some were not. Surprisingly, salary levels were only weakly related to turnover rates. However, schools with more faculty influence over decisionmaking had distinctly lower rates of turnover (table 3.2).

1 Background

Over the past decade, teacher supply and demand have been topics of increasing concern and interest among both education researchers and policymakers. However, although the subjects of teacher supply and demand have been of great interest and importance, they have been marked by substantial controversy. Researchers have found that assessing the availability, qualifications, shortages, and retention of teachers involves many factors that are neither easy to quantify nor to predict. As a result, policy research on these issues has resulted in highly contradictory findings and conclusions.

Beginning in the early 1980s, a series of highly publicized reports focused national attention on the possibility of severe national teacher shortages by the early 1990s (e.g., Good and Hinkel 1983; Darling-Hammond 1984; National Commission on Excellence in Education 1983). These projections came as a surprise to many; throughout much of the 1970s, there appeared to be a surplus of school teachers. Indeed, reductions in the teaching force were common to many schools and districts in the United States. However, researchers predicted that through the 1980s, teacher supply would decrease, while demand for teachers would increase. These analysts argued that fewer and less qualified college graduates were choosing to teach, while more children of the "baby boom" generation were entering the school system, driving up enrollments and, hence, hiring. Moreover, this growing imbalance between supply and demand would be exacerbated, according to this view, because of problems of teacher retention. A high level of teacher attrition, these analysts argued, was the largest source of demand for new teachers and a key factor behind the predicted shortages (e.g., Grissmer and Kirby 1987; Murnane, Singer, Willett, Kemple, and Olsen 1991).

The education research community has, however, not been unanimous in its assessment of the threat of teacher shortages. Some analysts have argued that teacher supply is and will continue to be adequate and that attrition is not particularly high (e.g., Feistritzer 1986; Hecker 1986). A study conducted in Indiana in the late 1980s by the Rand Corporation seemed to provide support for these arguments. This study suggested that teacher supply was up, due to increased re-entry of former teachers, and that attrition was actually at its lowest point in years, due to a stable work force and a decline in turnover among new teachers and women (Grissmer and Kirby 1992). As a result, there is now widespread confusion about whether teacher shortages are or will be a myth or reality.

In order to address this ongoing debate and controversy over teacher supply and demand and to rethink the direction and agenda for research on these issues, NCES, in collaboration with the National Research Council, convened a conference in the spring of 1991. The conference brought together a wide spectrum of researchers and policy analysts concerned with the subject of teacher supply, demand, and quality.

The goal of the conference was to clarify and summarize the issues most relevant to education policymakers, school officials, members of the education research community, and others concerned with problems surrounding teacher supply and demand. The conference presentations were specifically designed to identify the major gaps in existing data, obstacles

confronting previous research efforts on these issues, and reasons for widespread inconsistencies in findings and conclusions. The meeting resulted in numerous specific recommendations for both data collection and data analysis. In particular, participants drew attention to the need to improve identification of the range of sources of teacher supply; develop better measures of the reserve pool of potential teachers, monitor the training levels and qualifications of the teaching force, assess the factors influencing demand for particular types of teachers, and examine the extent of, and reasons for, teacher turnover.[1]

In addition to formulating specific recommendations, the conference participants also identified two themes to guide future research. First, there was consensus that overall national figures on supply, demand, shortage, and turnover and predictions about possible national shortages of teachers are less useful than disaggregated and more specified research efforts directed at issues of immediate practical and policy importance. For example, the conference participants emphasized the relevance of identifying the effects of different settings and locales on teacher shortages and teacher turnover (e.g., Planchon 1992). Of specific interest, the conferees pointed out, are comparisons of data on supply, qualifications, and turnover across different subgroups, different types of teachers, and different types of schools. Do some fields of teaching, such as mathematics, face more significant problems related to the availability of teachers? Do some schools have higher levels of teacher turnover?

Second, there was consensus that assessments of teacher supply, demand, shortage, or retention should focus on quality, not quantity. It was argued, for example, that assessing the numbers of potential teachers was less important and useful than assessing the qualifications and quality of those available to teach (e.g., Kennedy 1992). Participants felt that it is necessary to draw out the implications of teacher shortages and teacher turnover for teacher and teaching quality and, ultimately, school quality and effectiveness.

Moreover, the participants emphasized that focusing on specific subgroups, settings, and populations and on the qualifications of teachers is necessary to address questions of equity. Regardless of whether extensive shortages of teachers throughout the nation occur or not, it is important to assess the extent to which particular kinds of students or schools suffer from a lack of qualified teachers. Do all children in this country, particularly children from poorer families, have similar access to qualified teachers?

Conference participants also pointed out that a paucity of data has hampered research on many of these issues, a concern repeatedly voiced by analysts of teacher supply, demand, and quality over the past decade (e.g., Darling-Hammond and Hudson 1990; Murnane and Raizen 1988; Shavelson, McDonnell, and Oakes 1989; Grissmer and Kirby 1987; Haggstrom, Darling-Hammond, and Grissmer 1988; National Education Association 1987).

In response to these concerns, NCES has produced reports over the past several years utilizing two new sources of data on teacher staffing and occupational issues: the Schools and Staffing Survey and the Teacher Follow-up Survey. These surveys were initiated by NCES in the

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[1] The conference proceedings and a summary have been published by NCES; see Boe and Gilford 1992.

late 1980s in order to gather information on a wide range of issues concerned with the organizational, administrative, and occupational aspects of schools, in general, and on issues concerned with teacher supply, demand, and shortages, in particular (Haggstrom et al. 1988). These reports include studies on sources of teacher supply (Rollefson 1993; Rollefson and Broughman 1995), rates and variations in individual teacher attrition (Arnold, Choy, and Bobbitt 1993; Bobbitt, Faupel, and Burns 1991; Bobbitt, Leich, Whitener, and Lynch 1994), the match between the supply of and demand for qualified teachers (McMillen and Bobbitt 1993; Bobbitt and McMillen 1995), and overviews of all these issues (Hammer and Gerald 1991; Arnold and Bobbitt 1993; Choy, Medrich, Henke, and Bobbitt 1992, chapters 3 and 7; Choy, Henke, Alt, Medrich, and Bobbitt 1993b, chapters 3 and 7; Choy, Bobbitt, Henke, Medrich, Horn, and Lieberman 1993a, chapters 3 and 5).

This report builds on these earlier efforts. It is organized into three sections focusing on three sets of topics concerned with teacher supply and demand:

1. Teacher Supply and Teacher Turnover: An Overview

   - *What are the major sources of supply for the elementary and secondary teaching force?*
   - *How much teacher movement occurs among and between schools?*
   - *What are the primary destinations of teachers exiting teaching jobs?*

2. The Supply of Qualified Teachers

   - *What are the education and training levels of the high school teaching force?*
   - *How well do high school teachers' qualifications match the assignments in which they are placed?*
   - *To what extent do levels of teacher qualifications and the degree of match between qualifications and assignments differ across different types of schools, different types of teachers, and different types of students?*

3. Teacher Turnover

   - *Do particular types of schools bear the brunt of teacher turnover?*
   - *What characteristics of schools are associated with teacher turnover?*
   - *What are the actual levels of turnover at different types of schools?*

Sources of Data

The primary data source for this report is the nationally representative NCES 1990-91 Schools and Staffing Survey (SASS). SASS is the largest and most comprehensive data set available on the staffing, occupational, and organizational aspects of the nation's elementary and secondary schools and includes a wide range of information on the personal characteristics, job attributes, and attitudes of teachers and on the characteristics of a wide range of schools and

districts across the country. SASS was designed to provide national- and state-level estimates for public schools and national- and affiliation-level estimates for private schools.

The 1990-91 SASS included four sets of linked questionnaires: for each school sampled, for the central district office of public schools; for the principal in each school; and for a random sample of teachers in each school. The sizes of the SASS samples utilized in this report are: 4,884 public school districts, 8,969 public schools, 2,620 private schools, 46,705 public school teachers, and 6,642 private school teachers, including both full-time and part-time teachers.

Following the recommendation of the 1991 NCES conference (discussed above), this report focuses on the extent to which teacher supply, qualifications, and turnover vary across different subpopulations of schools and across different subpopulations of teachers. The main teacher subgroup comparisons examined in this report are based on sex, race, experience, level of education, and part-time or full-time status.

The main school subgroup comparisons examined are based on sector (public, private); percentage minority students; size of student enrollment; level (elementary, secondary, combined); and community or locale (rural or small town, urban fringe or large town, central city). In addition, for private schools, comparisons are also made based on the orientation or affiliation of the school (Catholic, other religious, nonsectarian). For public schools, comparisons are also made based on student population poverty levels.

This report also selectively utilizes the 1991-92 Teacher Follow-up Survey (TFS), which was developed in conjunction with SASS. The TFS obtained additional information from a subset of teachers from the SASS teacher sample a year after the original questionnaire had been administered. The purpose of the TFS is to compare teachers who left teaching with teachers who stayed in teaching between the 1990-91 and 1991-92 school years. The TFS included two separate questionnaires: one for a sample of former teachers and one for a sample of continuing teachers. The sizes of the TFS samples used in this report are: 4,761 public school teachers and 1,972 private school teachers.

More detail on the technical aspects of the 1990-91 SASS and the 1991-92 TFS are included in the Technical Notes at the end of this report. All figures and estimates presented in this report are based on samples and hence are subject to sampling error. Standard errors indicating the accuracy of selected estimates are included in the Appendix. All comparisons and differences discussed in the report itself are statistically significant at the .05 level, unless otherwise noted.

Teacher Supply and Teacher Turnover: An Overview

It is useful to begin an analysis of teacher supply and demand with an overview of the teaching workforce—who constitutes the teaching workforce, where teachers come from when they enter the teaching workforce, and where they go when they leave the teaching force. The objective of this section is to provide a context and a starting point for the analyses to follow. It presents an overview of the major sources of supply of teachers, the major flows of teachers

within the school system, and the major destinations of teachers leaving the school system. The data presented indicate the magnitude of teacher movements among and between these various components and their relationships to one another.

In the 1990-91 school year, just under 3 million (2,915,774) elementary and secondary school teachers were employed in the U.S. education system. At the precollege level alone, teaching is a relatively large occupation. In 1991, it accounted for 14 percent of all "white collar" employees—those employed in "managerial and professional specialties" in the United States (U.S. Bureau of the Census 1993, 405).

About 88 percent of elementary and secondary school teachers were employed in public schools. In both public and private schools, over 70 percent of teachers were female. About 13 percent of public school teachers and about 8 percent of private school teachers were from minority groups. The average age of teachers in both public and private schools was about 40 years. The overwhelming majority of these teachers were employed full time: 92 percent in the public schools and 85 percent in the private schools. The average length of teaching experience was about 14 years (Choy et al. 1993b).

Figure 1.1 depicts the major flows of teachers into, through, and out of elementary and secondary schools, both public and private. The data were collected at two separate times and, hence, do not represent a market or actual exchange of teachers; they illustrate the types and magnitudes of flows. Data on the flows of teachers into schools were drawn from the Teacher Survey of SASS. These movements occurred just before or at the start of the 1990-91 school year. Data on the flows of teachers between and out of schools were drawn from the 1991-92 TFS. These movements occurred after the 1990-91 school year and before the end of the 1991-92 school year. In figure 1.1, a description is given below each line of what the flow represents. Above each line is the number of teachers included in that flow. The numbers refer to head counts, including both full-time and part-time teachers.

The analysis in this section is at the level of the school. Hence "new hires" and "exits" refer to those newly entering or leaving a particular school. For example, transfers between private and public schools, within public school districts, or between public districts are all considered new hires and exits. Reassignments within a school are not defined as new hires or as exits.

About 388,000 or 13 percent of all teachers were newly hired to their teaching jobs at the beginning of the 1990-91 school year. As figure 1.1 shows, these new hires came from a number of sources. Notably, about 68,000 or less than 20 percent of the newly hired, in both public and private schools, came directly from colleges and universities (Box 3). This source of new hires included two components.

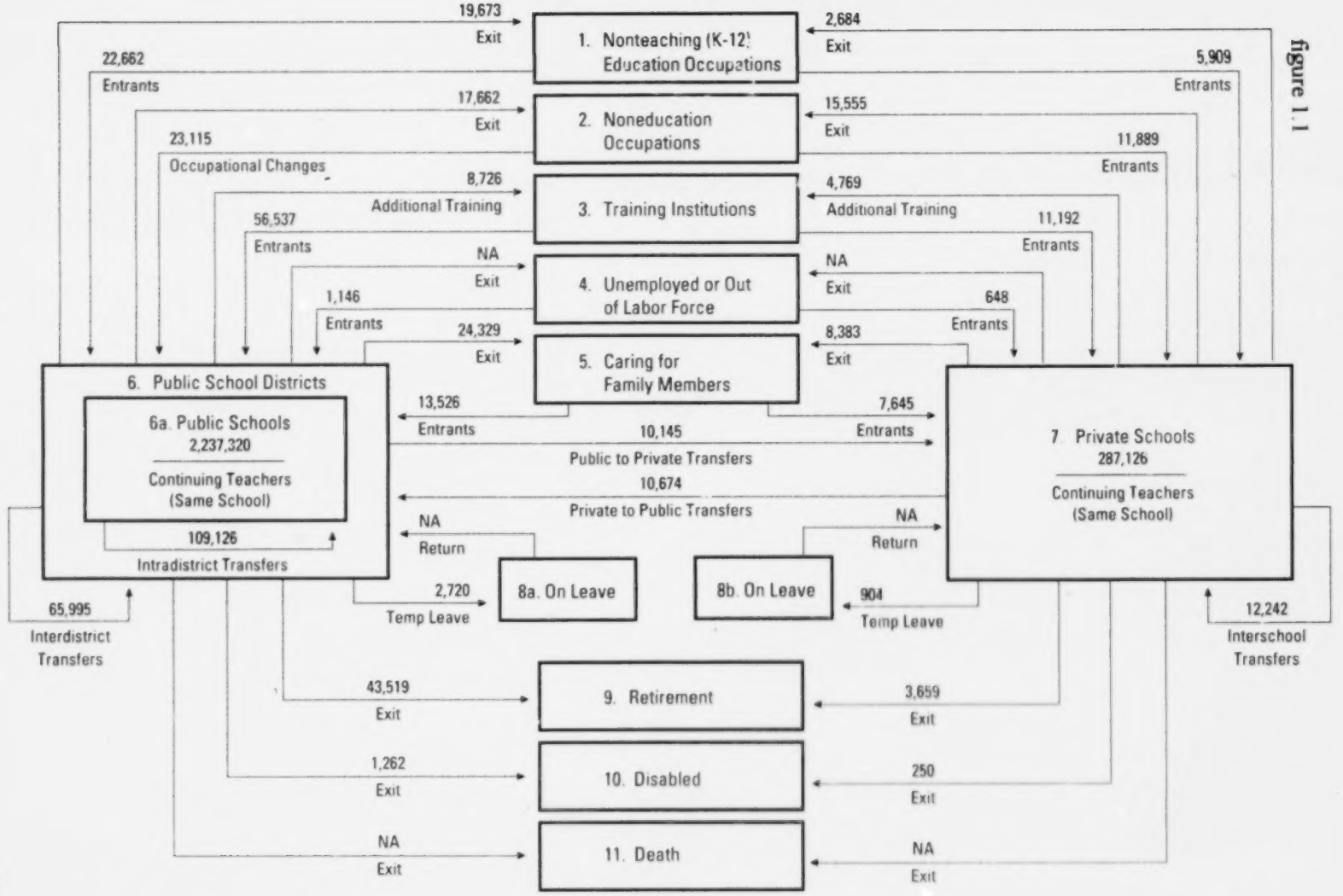

Figure 1.1 – A model of the flow of teachers into, through, and out of schools: 1990-1992

NA - data not available

Source: U.S. Department of Education, National Center for Education Statistics, Teacher Follow up Survey, 1991-1992 and Schools and Staffing Survey, 1990-1991 (Teacher Questionnaire).

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One component of those entering teaching jobs from higher education institutions was newly minted college graduates with bachelor's degrees. Of these recent college graduates, most had received formal training in pedagogical methods and teaching skills; that is, they were graduates of conventional state-approved teacher preparation programs. Graduates from such programs receive a regular or standard teaching certificate in a field of specialization, such as mathematics, elementary education, or physical education.

A second and smaller component of those newly hired from colleges and universities were actually re-entrants—former teachers who had returned to the university for additional education and then subsequently re-entered the teaching workforce. (For a detailed analysis of these two supply components, see Rollefson 1993 and Rollefson and Broughman 1995). In addition to colleges and universities, other types of jobs and occupations were a second major source of new hires for schools. This cross-occupational movement was divided between those who entered teaching from other jobs within the field of education, such as counseling, administration, preschool and postsecondary positions (Box 1), and those who came from noneducation occupations (Box 2). Eighteen percent of new hires (about 12,000) in private schools came from noneducation occupations; 7 percent (about 23,000) did in public schools.

A third source of the newly hired was the ranks of full-time parents or those caring for family members. Members of this group were either returning to teaching after a time away, for example, for child rearing, or entering teaching for the first time (Box 5). Eleven percent (about 7,600) of new hires in private schools came from the ranks of parents and family caregivers, while 4 percent (about 13,500) did in public schools.

By far, however, the largest source of new hires to schools was the school system itself. Over 50 percent of all new hires were "movers"—teachers who were already teaching and transferred or migrated from one school to another.

Thus, figure 1.1 illustrates one of the complexities underlying research on teacher supply and demand: the entry or supply of teachers into jobs cannot be understood without analyzing the exits or turnover of teachers from jobs. The same sources of supply for new hires—colleges or universities, nonteaching jobs, former teachers who are full-time parents—were also destinations for individuals leaving their teaching jobs. Indeed, in the example of movers, job entries and exits were synonymous.

At the end of the 1990-91 school year, over one-third of a million teachers exited their jobs. This turnover represented 13 percent of those employed in the teaching force. The numbers of those who moved to teaching jobs in other schools were higher (about 209,000) than those who left the occupation altogether (about 174,000).

Teachers moved from or left their jobs for many reasons: some exits were voluntary and some involuntary. Teachers left because they were dissatisfied or because their spouse was transferred to another region. Some were fired from their jobs; others quit. Teachers in public districts could have been subject to forced transfers from one school to another. (For a more detailed analysis of the reasons teachers give for exiting jobs, see Bobbitt et al. 1991, 1994). Notably, a surplus of teachers does not appear to have been a major factor in 1990-91: less than 2

percent of turnover from public districts and private schools resulted from layoffs due to budget limitations, declining enrollment, or elimination of courses (Choy et al. 1993b, chapter 7).

Among teachers who moved to new teaching positions, the largest component was shifting within and between public schools. Almost 60 percent (about 109,000) of those who moved from public school jobs simply transferred to other teaching jobs within the same district (Box 6). Another third (about 66,000) moved to teaching jobs in other public school districts.

Cross-sector moves were particularly noteworthy. Approximately the same number of teachers left private school jobs for public school jobs as the reverse. However, private schools represented only about 12 percent of the total employed teaching force. As a result, public to private school moves represented a far smaller portion of employed public school teachers than private to public transfers did of private school teachers. Forty-six percent of those who moved from private school jobs moved to public schools. In contrast, only 5 percent of movers from public school jobs moved to private schools.

Of those who left the teaching occupation altogether, distinct differences were found between public and private school teachers. Retirement (Box 9) accounted for one-third of those (about 43,500) who left public school jobs, but only for 8 percent (about 3,700) of those who left private school jobs. Fourteen percent of those who left public school jobs ended up working in occupations outside of education, while 36 percent of those who left private schools did so (Box 2). Fifteen percent of those who left public school jobs ended up working in a nonteaching occupation in education, while 6 percent of those who left private schools did so (Box 1). On the other hand, about equal portions (19 percent) of those who left public and private school jobs became full-time parents or caregivers for their families (Box 5). Finally, even smaller portions left their jobs to enter colleges or universities (Box 3).

Figure 1.1 provides an overall picture of the flows of teachers into, through, and out of schools in the U.S. education system. In particular, the chart highlights both the scale and diversity of teacher movement. Teaching is not only a large occupation but a fluid one, and the amount of movement to and from teaching jobs is a significant consideration for those charged with maintaining continuous and adequate staffing in the nation's schools. Moreover, coping with this movement is complicated by the diversity of sources of teacher candidates and of destinations for teacher exits.

Acknowledging the scale and the diversity of teacher movement raises questions and has important implications for research on teacher supply and demand. At first glance, the concepts of teacher supply and demand seem simple enough, but upon careful examination it becomes apparent that underlying these concepts are important subtleties that are not immediately obvious. As a result, assessing teacher supply and demand has proven to be a complex and difficult task for researchers. Only by recognizing the complexity of this interaction will analysts be in a better position to understand how to analyze, interpret, and present data on the supply and demand of school teachers.

For example, analysts of teacher supply often focus on quantifying the numbers of potential teachers in the larger population, otherwise known as the reserve pool. Given the diversity of sources of newly hired teachers, however, the reserve pool is probably both very large and largely unknowable. As figure 1.1 shows, only a small portion of the newly hired came directly from training institutions, such as colleges of education. Substantial numbers of teachers hired in any given year are re-entrants—former teachers who are returning. There are also substantial numbers of delayed entrants—trained teachers who did not seek a position immediately after their schooling (Rollefson 1993; Rollefson and Broughman 1995). Indeed, data from the NCES Recent College Graduates Survey indicate that as many as 40 percent of newly minted teachers do not seek teaching positions immediately after their schooling (Gray, Cahalan, Hein, Litman, Severynse, Warren, Wisan, and Stowe 1993; Frankel and Stowe 1990). Some delay their entrance into teaching, and some never teach. Ostensibly, all of these newly minted teachers are members of the reserve pool. As a result, it is very difficult to quantify the reserve pool.

However, of greater practical importance for school officials and of greater empirical relevance for researchers is not whether there will be sufficient numbers of potential teachers in the reserve pool, but how many individuals actually seek positions, where they do so and with what level of qualifications. The diversity of sources of teacher supply also raises questions about the quality and qualifications of these incoming teachers. How many hold regular teaching certificates, how many do not, and does this vary across different types of schools? Moreover, the question of teacher qualifications is not simply a matter of training, but also of fit.

The employment of teachers by schools involves a complex process of matching school staffing regulations and needs (the demand side) with the characteristics of those available and willing to accept teaching positions (the supply side). Assessing the balance or imbalance between supply and demand requires an examination of how well the current mix of qualifications, among those individuals seeking positions, match up with the current needs of local school systems. How well are teachers' professional qualifications related to teaching assignments? To what extent is there a mismatch between teacher qualifications and the requirements of certain teaching assignments? In short, what are the patterns of teacher availability, quality, and utilization, and moreover, how do these patterns vary across different types of schools with different mixes of students? Chapter 2 will examine these questions in more detail.

Finally, it is also important to recognize the implications of the scale and diversity of teacher movement for the demand side of teacher employment. The two types of teacher exits—migration and attrition—are the leading factors affecting demand for new teachers. Figure 1.1. shows that the magnitude of these movements are significant. However, it does not show where these movements take place. Is the movement of teachers out of schools equally distributed? Do particular types of schools bear the brunt of teacher turnover and, hence, the need to fill vacancies? Do poor, urban public schools, for example, have particularly high levels of teacher turnover? Are there particular aspects of schools that lead to high teacher turnover? For example, do teachers' working conditions make any difference to levels of teacher turnover? Chapter 3 will examine these questions in more detail.

2 The Supply of Qualified Teachers

Research on teacher supply and the adequacy of school staffing typically has focused primarily on understanding the problem of shortages. Most simply put, shortages of teachers occur where demand, or the number of teaching positions funded, exceeds supply, or the number of teachers available. As a result, such research typically seeks to assess the quantities of teachers available, the quantities of teachers needed, and the gap between the two.

This chapter adopts a different emphasis. Rather than focus on whether or not there are or will be sufficient numbers of potential teachers, this analysis focuses on the actual fit between the needs of schools and the qualifications of the teachers currently employed. That is, the focus shifts from assessing the adequacy of the quantity of potential teachers to assessing the adequacy of the quality of employed teachers.

The premise underlying this analysis is that an accurate determination of whether problems exist in the supply of teachers requires an examination of teacher qualifications and, in particular, an assessment of the distribution of teachers and their qualifications across schools and students. There are several reasons why this shift in focus is both relevant and important.

Analysts of teacher supply and demand typically focus on the prevalence of unfilled teaching positions in schools as an obvious and concrete indicator of teacher shortages. However, data from SASS indicate that despite the fact that school administrators frequently report difficulties in filling teaching openings, U.S. schools have very few unfilled positions (Choy et al. 1992, chapter 7; Choy et al. 1993b, chapter 7). In reality, schools often simply cannot and do not leave teaching positions unfilled, regardless of supply.

School officials may use two general strategies to reduce shortfalls between the supply of and demand for particular kinds of teachers. One involves altering the quantity demanded, and the other involves altering the quantity supplied (Haggstrom et al. 1988). The first strategy is to decrease the demand for certain kinds of teachers by eliminating either existing or new teaching positions. This would inevitably result in increases in teachers' courseloads, class sizes, or pupil/teacher ratios. Data from SASS indicate that this mechanism has not been used with frequency in recent years (Choy et al. 1992, chapter 7; Choy et al. 1993b, chapter 7).

A second possible strategy is to increase or alter the quantity of teachers supplied. One version of this strategy increases the quantity supplied by increasing salaries. However, the evidence for this is mixed. Average starting salaries for public school teachers have increased (in real dollars) over the past decade, but only after steady decreases through the 1970s. In fact, the average starting salary for public school teachers in 1991 was about equal to that in 1972 (NCES 1992). Moreover, the salaries of new college graduates who have become teachers in recent years have been considerably below those of new college graduates who chose most other occupations (Gray et al. 1993; Frankel and Stowe 1990).

Another version of the second strategy alters the quantity supplied by filling a position with an underqualified candidate. This could be accomplished by shifting existing staff to areas of greater need; that is, assigning teachers trained in one field to teach in another. For example, social studies teachers could be assigned to teach mathematics courses. Alternatively, school officials could hire teacher candidates who are available, but underqualified. Evidence from SASS indicates that the latter set of strategies have been commonly used. For both public and private schools, among the most common methods of coping with difficulties in filling openings were hiring less qualified teachers, assigning other teachers, and using substitute teachers. For instance, in 1991, of public school principals who indicated that they had difficulty filling openings, 50 percent reported using substitute teachers as a remedy (Choy et al. 1993b, chapter 7).

Moreover, over the past decade, numerous states and jurisdictions have eased teacher hiring and training requirements. These changes have been instituted for a number of reasons, but their net effect is to help schools overcome difficulties in staffing their schools. Many, for instance, have instituted nontraditional or alternative recruitment programs whereby college graduates can postpone formal education training, obtain a temporary or provisional teaching certificate, and begin teaching immediately (Feistritzer 1990). Data from SASS indicate, for example, that as many as 15 percent of new hires in both public and private schools held alternative certificates in their main field of assignment in 1991 (Rollefson 1993; Rollefson and Broughman 1995).

As a result, not only is the supply of teachers large and diverse, but it is also highly flexible. The outcome is that real and widespread shortages in the numbers of potentially available teachers, that is, body counts alone, are virtually impossible. Given the complexity of these factors, it is not surprising that efforts to forecast and quantify teacher supply, demand, and shortages have often resulted in widely different conclusions. Thus, analysts have increasingly argued that research on teacher supply, demand, and shortages should shift from a focus on quantity to a focus on quality (e.g., Boe and Gilford 1992; Haggstrom et al. 1988; Darling-Hammond and Hudson 1990; National Education Association 1987). That is, rather than focus on whether there will be sufficient numbers of potential teachers, the emphasis should be on the actual fit between the needs of schools and the qualifications of the teachers currently employed.

Assessing levels of teacher qualifications and quality, like assessing quantity, is a difficult and ambiguous task. How to define and measure a qualified teacher and quality teaching are subjects of great controversy (Haney, Madus, and Kreitzer 1987; Ingersoll 1995a). There is, however, almost universal agreement that among the most important characteristics of a qualified teacher are training and preparation in the subjects or fields in which he or she is teaching. Research has shown moderate but consistent support for the reasonable proposition that subject knowledge (knowing what to teach) and teaching skills (knowing how to teach) are important predictors of both teaching quality and student learning. (For reviews of this research, see Shavelson et al. 1989; Darling-Hammond and Hudson 1990; Murnane and Raizen 1988). Knowledge of subject matter and knowledge of pedagogical methods do not, of course, guarantee quality teaching, or even qualified teachers, but both are necessary prerequisites. That is, most would agree that training and knowledge are necessary, but not sufficient, requirements of qualified teachers.

As a result, beyond its connection to the problem of shortages, the assessment of teacher qualifications and quality has been a subject of great importance in its own right. Indeed, it has been an important part of two streams of education reform over the past decade.

The first of these streams has sought to improve teacher and teaching quality by emphasizing the need for greater assessment and accountability of schools and teachers. Especially in the case of elementary and secondary school levels, the perception of this group is that school problems are, to an important extent, teacher problems—that is, there are significant inadequacies of ability, training, motivation, and commitment of teachers in the United States (Wise 1979; Kirst 1989). For these reasons, concern with adequate background preparation for teachers has been an ongoing issue in the education policy arena. This lies, for instance, behind recent efforts made by many states to increase the college coursework requirements for teachers, the enactment of more stringent teacher certification standards, and the increased use of teacher testing. The reforms advocated by this group are designed to toughen entry standards into teaching, unlike the alternative and emergency recruitment and certification programs mentioned earlier that are designed to ease entry requirements (Darling-Hammond and Hudson 1990; Weis, Altbach, Kelly, Petrie, and Slaughter 1989).

The second of these education reform streams has sought to improve teacher and teaching quality by emphasizing the need for greater teacher professionalism. The perception of this group is that teacher and teaching problems are, to an important extent, school problems—that is, there are significant inadequacies in the working conditions, resources, status, support, and compensation afforded to teachers (e.g., Holmes Group 1986; Carnegie Forum 1986; Darling-Hammond 1984; Rosenholtz 1989; Sergiovanni and Moore 1989). For these reasons, concern with the professionalization of teaching has also been an ongoing issue in the education policy arena. This lies, for instance, behind recent efforts made by many states to increase teacher salaries and to implement reforms designed to foster the professional development and growth of teachers.

One of the traditional attributes and criteria that distinguish professions is expertise; professionals are not generalists but possess expertise over a specific body of knowledge and skills. To advocates of teacher professionalism, teaching is a highly complex set of skills and knowledge that is not easily acquired. The role of schools in this view should be to foster teachers' expertise through inservice, mentoring, and master teacher programs. From this viewpoint, widespread assignment of teachers to teach subjects for which they are not trained is an example of inappropriate use or underutilization of the training and skills of professional teachers (e.g., Murnane and Raizen 1988; Darling-Hammond and Hudson 1990).

Hence, two distinct elements of teacher qualification are emphasized by these streams of education reform. First is the element of teacher education, training, and preparation. The premise is that in order to teach adequately, teachers must have a basic college education, teacher training, and expertise in a specialty field. The focus is on the quantity and quality of preparation.

Second is the element of placement or utilization of teachers. The premise is that teachers must be assigned to teach in fields for which they have adequate background. Teachers trained, for example, in social studies are presumed unlikely to have a solid understanding of physics. The

focus is on whether the fields of teacher assignment match the fields of training and preparation of the teacher. Mismatch or out-of-field teaching is where teachers are teaching subjects for which they have little training.

Of course, some degree of mismatch, misassignment, or out-of-field teaching may be unavoidable and may not be an indicator of a shortage of qualified teaching candidates, inadequate training of teachers, or the improper utilization and placement of teachers. School administrators charged with the task of offering programs in a range of required and elective subjects may often be forced to make spot decisions concerning the assignment of available faculty to an array of changing course offerings. However, to advocates of raising standards of teacher quality and qualifications, whether they be teachers, policymakers, or parents of school-age children, even low levels of out-of-field teaching are a concern.

In addition to problems of conceptualizing and assessing the adequacy of teachers' qualifications, researchers have also been hampered by a lack of data—a problem repeatedly voiced over the past decade by numerous analysts (e.g., Darling-Hammond and Hudson 1990; Murnane and Raizen 1988; Shavelson et al. 1989; Grissmer and Kirby 1987; Haggstrom et al. 1988). Until recently, the necessary data have not been available, especially at the national level, to assess either overall levels of teacher training and education or the extent of the match between teacher training and assignments.

This chapter uses data from SASS to address the question of how adequately the nation's high schools are staffed. The analysis focuses on whether or not teachers have basic training in the subjects they teach. It does not present data on the quality of teaching, or on the quality of teacher education. It presents data on the levels of teacher education, on the degree of match between teacher education and teacher assignment, and on the extent to which these differ among different types of teachers, different types of schools, and different states. Specifically, it addresses the following sets of questions:

1. *What are the education and training levels of high school teachers? To what extent do these levels vary across different types of schools and different types of teachers?*

2. *How well do high school teachers' qualifications match the fields they are assigned to teach? To what extent do these levels vary across different types of schools and different types of teachers?*

    - Do male or female, new or experienced, minority or nonminority, part-time or full-time teachers more often teach courses out of their fields?

    - Is out-of-field teaching more likely to occur in schools with high percentages of poor or minority students?

- Are higher levels of out-of-field teaching more likely to occur in public or private schools?

- Are small rural schools more prone to fill classrooms with underqualified teachers?

3. *What proportion of high school students are taught by teachers out of their fields?*

   - Are there inequities in the degree to which particular types of students are taught by underqualified teachers?

Methods and Measures

As indicated, this analysis is based on the premise that among the most important characteristics of a qualified teacher is training in the subjects or fields to be taught. Training in the subject taught does not, of course, guarantee quality teaching, or even qualified teachers, but it is a necessary prerequisite for both. However, empirical examination of the extent to which teachers are assigned to teach in fields for which they do or do not have adequate or appropriate training is difficult because "adequate" or "appropriate" background training and preparation can be defined in a number of different ways.

The most commonly used measures focus on whether teachers are certified in their teaching assignments. Even as an indicator of basic training, whether a teacher has certification or not has limits. Teacher certification requirements vary widely across states; some, for instance, include a major in a substantive field, and some do not. Moreover, many states do not require certification for private school teachers (Tryneski 1992; Feistritzer 1990).

The definition of teaching assignment is also not straightforward. The most commonly used measures focus on teachers' main teaching assignments. However, it is possible for teachers, especially at the secondary school level, to teach in more than one field. That is, physical education teachers, for example, may not simply teach physical education; they may have additional assignments. As a result, it is unclear how much of teachers' class schedules are excluded in measures limited to teachers' main assignments.

Finally, fields can be defined and subdivided in different ways, both narrowly and broadly. For instance, a broad definition of the field of social studies might consider within-department assignments, such as history teachers teaching economics, to be in field. A narrow definition, on the other hand, might require teachers of economics to have a degree in economics to be considered in field.

In an in-depth examination of the conceptualization and empirical assessment of out-of-field teaching in public schools, Bobbitt and McMillen (McMillen and Bobbitt 1993; Bobbitt and McMillen 1995) have illustrated how the ways in which out-of-field teaching is defined have a substantial effect on the extent of mismatch found. They have developed a useful

continuum of measures of out-of-field teaching from SASS which vary, depending on the extent of teachers' training and college credits in particular fields and the extent of their assignments in those fields. The analysis in this chapter builds on their efforts.

The measures of out-of-field teaching presented in this report focus on minimal levels of background preparation in broadly defined fields. Hence, the measures are conservative and may, in fact, *understate* the level and degree of underqualified or out-of-field teaching. This is intentional. Rather than enter the debate as to what constitutes a qualified teacher, quality teacher training, or quality teaching, this report presents data on the numbers of teachers who lack even basic prerequisites in the fields they were assigned to teach. The underlying premise is that even a moderate number of teachers lacking such minimal training prerequisites is a strong indication of inadequacies in the staffing of high schools.

Moreover, this analysis focuses solely on teachers who taught students at the high school level (grades 9-12). For several reasons, the argument against out-of-field teaching is especially unambiguous for the high school level. First, at the high school level, teachers are divided by fields into departments; faculties are thus more specialized than in elementary schools, and therefore the differences between fields are more distinct and, perhaps, greater. Moreover, the level of mastery in different subjects is higher at the high school level, and therefore, a clear case has been made by policy analysts and researchers that teachers ought to have adequate background in the subjects they teach (e.g., Murnane and Raizen 1988; Darling-Hammond and Hudson 1990).

Measures of both teacher qualifications and of out-of-field teaching are developed from teachers' reports of their background training and their teaching assignments in the 1990-91 SASS Teacher Questionnaire. Teachers were asked to list the subject taught, grade level, and number of students enrolled for each class period in their school day. In addition, teachers reported their certification status and the major and minor fields of study for each of their degrees earned, both undergraduate and graduate levels. The sample utilized in this analysis consists of 22,632 teachers, including those employed both full time and part time, all of whom taught students in grades 9-12. Some were employed in high schools, some in senior high schools, some in secondary schools, and some in combined schools. The measures constructed from these data are described below.

Measures of Teacher Qualifications

- **Bachelor's Degree**: percentage of teachers who had completed an undergraduate education

- **Master's Degree or more:** percentage of teachers who had completed a graduate degree

- **Certification:** percentage of teachers who had formal training in teaching methods and pedagogical skills. This measure includes only regular, standard, or probationary state-approved certification. The latter is the initial certificate issued after satisfying all

requirements except the completion of a probationary period. This measure excludes temporary, emergency, or provisional status certification.

Measures of Out-of-Field Teaching

- **Class schedule with no major/minor**: the percentage of teachers' work assignments (total classes taught) in which they taught in fields without at least a minor in that field.

- **Teachers with no major/minor in assignment**: the percentage of teachers who taught one or more classes in a field without at least a minor in that field. This measure includes all those who taught in each field and does not distinguish the amount of out-of-field teaching each teacher did in each field. Some teachers may have taught one small class out of field, while others may have taught many large classes out of field.

- **Students of teachers with no major/minor in assignments:** the percentage of students enrolled in classes in each field who were taught by teachers who did not have at least a minor in that field. This measure illuminates the proportion of students receiving out-of-field teaching.

These definitions of out-of-field teaching are illustrated by the following example:

A teacher has a bachelor's degree in sociology and has recently finished a fifth-year teacher education program leading to a teaching certificate in secondary social studies. In her first teaching job, she is assigned each day of the week to teach two sections of world history to 10th graders, two sections of economics to seniors and one section of 9th-grade algebra. In this analysis, she would be teaching five classes and two fields. The one class in algebra, or 20 percent of her schedule, would be out of field.

Several features of the out-of-field teaching measures should be noted.

Adequate training is defined as a level of minimal substantive background. The above measures of out-of-field teaching indicate how many teachers held at least a college minor in the subject field, regardless of whether they were certified or not. This includes both education majors and minors and liberal arts majors and minors; hence, a teacher with a bachelor's degree in mathematics education or with a minor in mathematics who was teaching mathematics is defined as in field. It should be noted that many teachers held multiple degrees, and many held multiple majors and minors; hence, many met minimal prerequisites in more than one field. It should also be noted that these measures do not account for informal training or life experience that may have imparted substantive knowledge to teachers.

Fields are broadly defined in this analysis. The range of both class subjects and college major/minors are categorized into eight fields parallel to conventional departmental divisions in high schools: mathematics, science, social studies, English/language arts, foreign languages,

vocational education, arts/music, and physical education.[2] Hence, a teacher with a college degree in economics who is assigned to teach history is not considered out of field; both are within the field of social studies. Likewise, a teacher with a minor in biology but teaching chemistry is also not defined as out of field; both are within the field of science.

The breadth of fields differs. Training in the field of mathematics is defined here as including only majors or minors in mathematics and mathematics education. Training in the field of science is defined as including majors or minors in any of the natural, biological, and physical sciences and science education. Training in the field of social studies is defined as including majors and minors in social studies education or in any of the many social sciences, such as sociology, psychology, economics, history, and political science.

Not all instances of out-of-field teaching are of equal magnitude. For instance, a teacher with a degree in English is probably less prepared to teach mathematics than a teacher with a degree in chemistry. However, both are defined as out of field. Moreover, some fields of physical science require substantial credits in mathematics, making such teachers minimally qualified to teach mathematics courses. On the other hand, the reverse may not be true; a degree in mathematics would not necessarily qualify a teacher to teach physical science courses. Hence, defining fields along departmental lines ignores some cases where out-of-field may not actually be underqualified teaching.

The objective of this analysis is to examine differences in the levels of teacher training and out-of-field teaching among different types of teachers and among different types of schools.

The teacher characteristics examined are:

- **sex**
- **race:** white or minority
- **experience:** experience at current school, not total overall teaching experience; recent hire refers to less than 3 years experience in current school
- **status:** part time or full time

The school characteristics examined are:

- **sector:** public or private
- **size:** student enrollment
- **community:** locale of school—rural/small town, urban fringe/large town, or central city
- **minority enrollment:** percentage nonwhite students
- **free or reduced-price lunch recipients:** poverty level for public schools—percentage of students receiving federal free or reduced-price lunch program
- **orientation:** affiliation of private schools—Catholic, other religious, or nonsectarian.

For more details on the definitions of these characteristics, see the Technical Notes.

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[2] See the Technical Notes for the categorization of disciplines and subjects into eight fields of training and eight fields of teaching assignments.

Results

Teacher Qualifications

The analysis begins by presenting data on the basic education and training levels of high school teachers in 1990-91. Tables 2.1 and 2.2 show the percentage of high school teachers by degree level and certification, as well as the extent to which these levels varied across different types of teachers and different types of schools.

Very few high school teachers did not have at least a bachelor's degree and, in fact, a majority held a master's degree or more. However, moderate differences were found in graduate education levels, depending on the type of teacher and the type of school. Experienced teachers, in particular, were more likely in both public and private schools to have graduate degrees.

Slight differences were also found in faculty education levels across different types of schools. Teachers in public schools were slightly more likely than private school teachers to have graduate degrees. Part of this difference appears to be due to the higher proportion of private school teachers who are inexperienced. Nonetheless, even among the experienced, public school teachers were more likely than private school teachers to have master's degrees. Smaller schools, in both the public and private sectors, had fewer teachers with advanced degrees than did larger schools. Notably, public schools with a high proportion of poverty-level students (50 percent or more) had a smaller proportion of faculty with graduate degrees than did schools with fewer poverty-level students (less than 20 percent).

Tables 2.1 and 2.2 also display data on the proportion of high school teachers who had formal teacher training, that is, who held regular state-approved teaching certificates. This includes those with probationary certificates (the initial certificate issued after satisfying all requirements except the completion of a probationary period). Ninety-six percent of public school teachers were certified. There was little variation in certification levels among public school teachers with one exception—those recently hired were less likely to hold certification. A number of states do not require private school teachers to hold regular state-approved certificates (Tryneski 1992; Feistritzer 1990) and, in fact, only 60 percent of private school teachers held such certificates. Moreover, only 52 percent of teachers in small private schools held certification, and less than half of recently hired private school teachers were certified.

Hence, in the 1990-91 school year, almost all high school teachers employed in the United States had obtained a college education and, in public high schools, almost all teachers had obtained formal training in teaching methods.

Out-of-Field Teaching

The analysis now turns to the second element of assessing the adequacy of staffing in the nation's high schools—the match between teacher qualification and assignment. This section first examines the proportion of teachers' class schedules for which teachers typically taught out of field. It then turns to an examination of the proportion of out-of-field teachers in each field.

Information on how much of their class schedule teachers taught out of field is displayed in the last column of tables 2.1 and 2.2. This measure indicates the average proportion of classloads for which teachers taught fields in which they did not have at least a minor.

Public school teachers taught, on average, about 15 percent of their classloads out of field. This amounted to about one course in six. (Our background analyses indicate that about 20 percent of all public high school teachers and about 33 percent of all private high school teachers taught one or more classes out-of-field in 1990-91). Recently hired teachers and minority teachers in public schools were assigned slightly more of their schedules out of field. Teachers in public schools serving higher percentages of minorities (i.e., 20 percent or more) were also assigned more out-of-field teaching than low-minority public schools (i.e., less than 20 percent minorities). Teachers in small public schools (with fewer than 300 students) were assigned more out-of-field teaching than in large public schools (with 600 or more students). Likewise, teachers in public schools with a high proportion of poverty-level students (those with 50 percent or more students receiving the federal free-lunch program) taught more out-of-field classes than teachers in schools with less than 20 percent poverty-level students.

Private school teachers taught more of their classes out of field than did public school teachers. On average, private school teachers did not have at least a minor in the field for about one-quarter of their scheduled classes. In particular, teachers in small private schools taught more of their classes out of field (about one-third) than did teachers in all other types of private schools. Just as in public schools, recently hired teachers were assigned more of their schedule out of field than more senior teachers. Unlike those in public schools, minority teachers in private schools taught less out of field.

Tables 2.3 and 2.4 turn to an examination of levels of out-of-field teaching in each field. These data address the following question: for each field, what proportion of teachers who taught one or more classes in that field did not have at least a minor in that field? The data clearly indicate that many teachers taught classes in fields for which they did not have minimal training. However, it is also clear that levels of out-of-field teaching varied substantially by field.

About 23 percent of all those who taught English did not have at least a college minor in English, literature, speech, communications, journalism, English education, or reading education. Approximately 32 percent of all those who taught mathematics did not have at least a minor in mathematics or mathematics education. About 19 percent of all those who taught science did not have at least a minor in one of the sciences or science education. Almost 19 percent of those who taught social studies did not have at least a minor in one of the social sciences, in history, in public affairs, or in social studies education.

However, out-of-field teaching levels also varied across different types of teachers. For example, in some fields, recently hired teachers taught out of field more often (figure 2.1). Among science, social studies, and English teachers in public schools, newer teachers were more often assigned to teach out of field than more senior teachers. Among science teachers in private schools, newer teachers were more often assigned to teach out of field than more senior teachers.

Table 2.1— Number of high school teachers, percentage of teachers, by highest degree earned, percentage of teachers certified, and average percentage of teacher's class schedule without at least a minor, by selected *teacher* characteristics: 1990-91

	Total Teachers	Less than Bachelor's	Bachelor's	Master's or More	Certification	Class Schedule with no Major/Minor
Total Overall	865,874	1.4	46.6	52.0	90	15.8
Public	755,691	1.3	46.0	52.7	96	14.6
Sex						
Male	374,877	2.1	42.2	55.6	96	14.1
Female	380,814	0.4	49.8	49.8	95	15.0
Race						
Minority	79,629	1.7	50.4	47.9	94	18.9
White	676,062	1.2	45.5	53.3	96	14.1
Experience						
Experienced	580,511	1.2	40.8	58.0	98	13.6
Recent hire	175,180	1.3	63.5	35.2	88	17.7
Status						
Part time	45,790	0.7	51.1	48.3	91	12.6
Full time	709,901	1.3	45.7	53.0	96	14.7
Private	110,183	2.4	50.1	47.5	60	24.4
Sex						
Male	50,195	1.6	48.6	49.7	56	25.1
Female	59,987	3.1	51.3	45.7	62	23.8
Race						
Minority	8,845	5.4	54.9	39.7	41	16.6
White	103,337	2.2	49.8	48.0	61	24.9
Experience						
Experienced	70,043	2.0	44.8	53.2	67	21.3
Recent hire	40,139	3.1	59.3	37.6	47	29.8
Status						
Part time	16,729	6.5	42.9	50.6	54	31.4
Full time	93,454	1.7	51.3	47.0	61	23.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Table 2.2— Number of high school teachers, percentage of teachers, by highest degree earned, percentage of teachers certified, and average percentage of teacher's class schedule without at least a minor, by selected *school* characteristics: 1990-91

	Total Teachers	Less than Bachelor's	Bachelor's	Master's or More	Certification	Class Schedule with no Major/Minor
Total Overall	865,874	1.4	46.6	52.0	90	15.8
Public	755,691	1.3	46.0	52.7	96	14.6
Size						
Less than 300	79,627	1.6	66 !	32.3	96	16.1
300-599	125,811	1.7	51.9	46.4	95	14.7
600 or more	518,041	1.1	41.6	57.3	96	14.2
Community						
Rural/sm. town	329,782	1.3	55.0	43.7	96	13.7
Urban fringe/lg. town	219,652	1.1	36.9	62.0	96	15.0
Central city	174,045	1.5	40.8	57.7	95	15.4
Minority Enrollment						
0-19%	410,654	0.9	46.6	52.5	96	12.3
20% or more	312,824	1.8	45.4	52.8	95	17.4
Free-Lunch Recipients						
Less than 20%	437,009	1.1	42.3	56.6	96	13.2
20-49%	207,279	1.4	51.6	47.0	96	15.7
50% or more	74,798	1.7	53.3	45.0	96	18.1
Private	110,183	2.4	50.1	47.5	60	24.4
Size						
Less than 300	35,873	5.3	59.6	35.1	52	36.6
300-599	30,917	0.5	49.3	50.2	63	17.5
600 or more	31,576	0.6	40.5	58.8	85	14.7
Community						
Rural/sm. town	17,443	3.6	63.9	32.5	55	34.8
Urban fringe/lg. town	31,214	1.5	48.4	50.2	64	18.0
Central city	49,710	2.3	46.6	51.0	59	23.5
Minority Enrollment						
0-19%	68,589	2.4	51.2	46.4	60	24.7
20% or more	29,778	2.0	48.0	50.0	59	21.6
Orientation						
Catholic	42,103	1.0	44.7	54.3	71	17.8
Other religious	29,437	5.4	56.1	38.5	55	35.7
Nonsectarian	26,963	1.0	52.2	46.8	48	19.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

Table 2.3— Percentage of high school teachers who taught one or more classes in a field without at least a minor in that field, by field and selected *teacher* characteristics: 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/Music	Phys. Ed.
Total Overall	32.1	18.7	18.9	23.2	16.7	20.4	17.1	18.0
Public	30.5	16.9	16.9	21.9	15.4	19.0	15.4	14.6
Sex								
Male	29.3	15.7	12.5	21.6	16.5	21.5	14.5	14.5
Female	31.7	18.9	25.8	22.0	15.0	16.3	16.3	14.9
Race								
Minority	42.5	21.0	17.3	31.6	20.9	20.3	13.0	18.1
White	28.9	16.5	16.9	20.8	14.4	18.8	15.6	14.2
Experience								
Experienced	29.2	14.9	15.5	20.0	14.3	17.9	16.1	13.9
Recent hire	34.4	24.3	22.3	27.6	18.4	23.3	13.9	17.2
Status								
Part time	24.9	25.7	20.1	21.0	14.8	18.9	3.3	15.6
Full time	30.6	16.7	16.8	21.9	15.5	19.0	17.5	14.6
Private	41.0	28.6	30.3	32.0	21.3	43.3	28.9	42.1
Sex								
Male	37.7	33.6	30.8	29.1	38.4	39.5	26.4	48.8
Female	44.1	21.6	29.6	33.4	14.2	46.0	31.3	35.2
Race								
Minority	24.5	21.7	-	37.8	14.6	-	-	-
White	41.8	29.0	30.8	31.8	22.4	42.8	27.9	43.4
Experience								
Experienced	37.6	23.0	29.7	26.4	20.0	45.4	27.3	39.0
Recent hire	47.0	37.3	31.5	40.0	24.3	39.4	31.4	47.2
Status								
Part time	54.6	18.4	30.3	47.6	23.4	-	24.4	-
Full time	39.2	29.8	30.3	29.0	20.9	38.4	30.3	42.2

- Too few cases for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

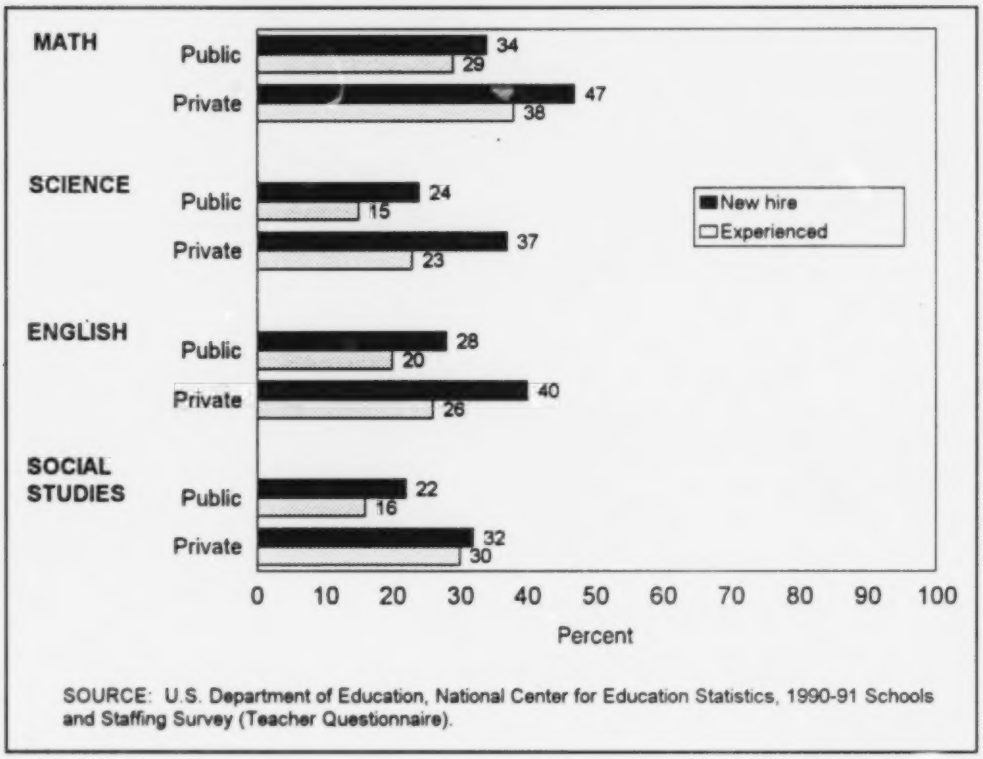
Table 2.4— Percentage of high school teachers who taught one or more classes in a field without at least a minor in that field, by field and selected *school* characteristics: 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/Music	Phys. Ed.
Total Overall	32.1	18.7	18.9	23.2	16.7	20.4	17.1	18.0
Public	30.5	16.9	16.9	21.9	15.4	19.0	15.4	14.6
Size								
Less than 300	40.3	24.4	23.8	26.9	29.8	14.9	18.9	22.2
300-599	33.8	20.3	19.1	27.3	14.8	16.8	10.8	17.6
600 or more	28.0	14.2	15.3	20.0	13.2	20.4	15.8	11.7
Community								
Rural/sm. town	30.2	18.0	17.5	21.5	18.3	15.9	16.0	14.0
Urban fringe/lg. town	30.2	15.6	17.7	23.0	11.1	20.5	12.5	17.4
Central city	31.3	14.6	15.1	22.0	14.3	24.1	17.3	11.4
Minority Enrollment								
0-19%	26.3	16.3	16.2	21.0	13.1	15.6	13.9	11.7
20% or more	35.1	16.7	17.9	23.4	18.3	23.4	18.0	17.8
Free-Lunch Recipients								
Less than 20%	27.7	14.0	15.7	19.2	11.6	19.4	14.6	12.3
20-49%	31.8	20.3	19.2	24.5	22.8	16.4	16.4	14.9
50% or more	40.0	20.2	18.0	30.7	21.1	21.4	16.1	22.4
Private	41.0	28.6	30.3	32.0	21.3	43.3	28.9	42.1
Size								
Less than 300	59.0	43.5	43.6	47.1	28.6	59.0	23.9	59.9
300-599	31.0	14.9	21.7	19.9	19.1	48.6	29.3	28.5
600 or more	21.9	7.7	16.4	19.6	10.9	-	35.0	19.3
Community								
Rural/sm. town	58.2	47.8	46.6	32.9	21.7	49.0	37.4	70.5
Urban fringe/lg. town	35.0	18.3	24.1	27.0	21.4	57.0	20.0	31.5
Central city	36.9	23.9	27.1	33.1	17.1	41.5	31.1	33.5
Minority Enrollment								
0-19%	41.4	30.8	34.3	31.1	17.5	46.6	27.7	46.1
20% or more	38.5	19.7	21.0	30.4	22.6	48.1	31.5	26.8
Orientation								
Catholic	33.1	20.1	21.3	22.0	8.7	27.3	36.2	24.9
Other religious	51.7	41.9	45.8	39.5	49.8	66.9	35.3	53.2
Nonsectarian	36.3	22.6	23.0	32.2	11.1	-	8.2	37.7

- Too few cases for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

Figure 2.1— Percentage of high school teachers who taught one or more classes in a core field without at least a minor in that field, by experience: 1990-91

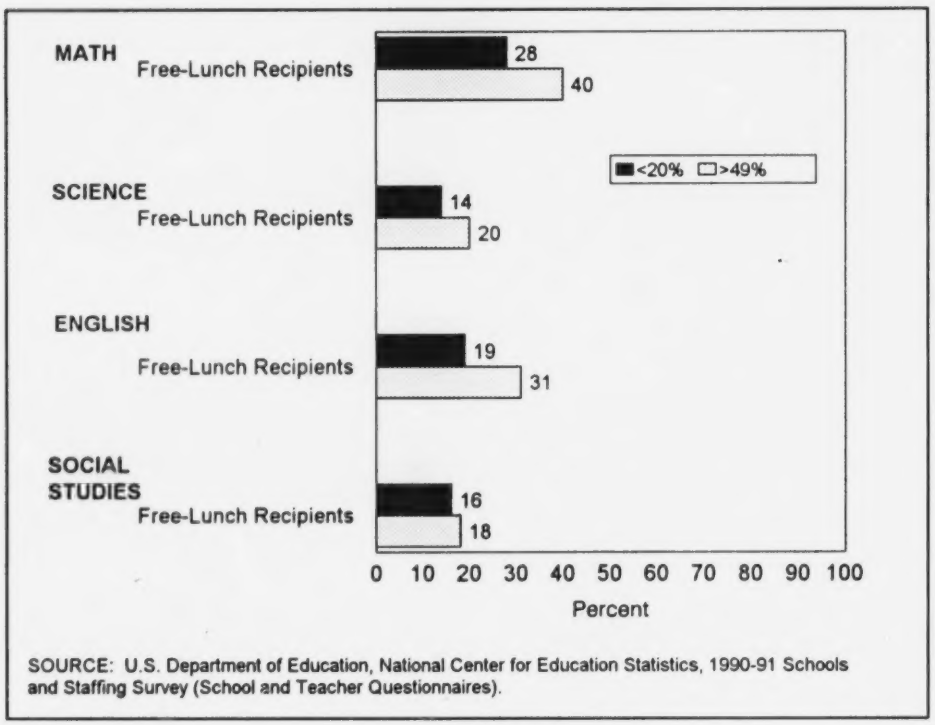


SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Out-of-field levels also varied considerably across different types of schools. Of particular interest to policy analysts are high-poverty schools. Do these schools have higher levels of out-of-field teaching than low-poverty schools? Figure 2.2 focuses on the comparison between public schools with a high proportion of poverty-level students (those with 50 percent or more of the students receiving the federal free-lunch program) and public schools with a low proportion of poverty-level students (less than 20 percent recipients). Notably, the data indicate that, in some fields, high-poverty public schools have more out-of-field teaching than do low-poverty schools. Schools with a high percentage of poverty-level students had a higher percentage of faculty teaching out of field in mathematics, science, and English than schools with less than 20 percent poverty-level students.

In all four core academic fields, private school teachers were more likely to have taught out of field than public school teachers. There was, however, diversity within the private sector. Levels of out-of-field teaching in both Catholic and nonsectarian private schools were close to those in the average public school. On the other hand, teachers in other religious schools had distinctly higher out-of-field teaching levels than public school teachers in the four core academic fields.

Figure 2.2— Percentage of *public* high school teachers who taught one or more classes in a core field without at least a minor in that field, by free-lunch recipients: 1990-91

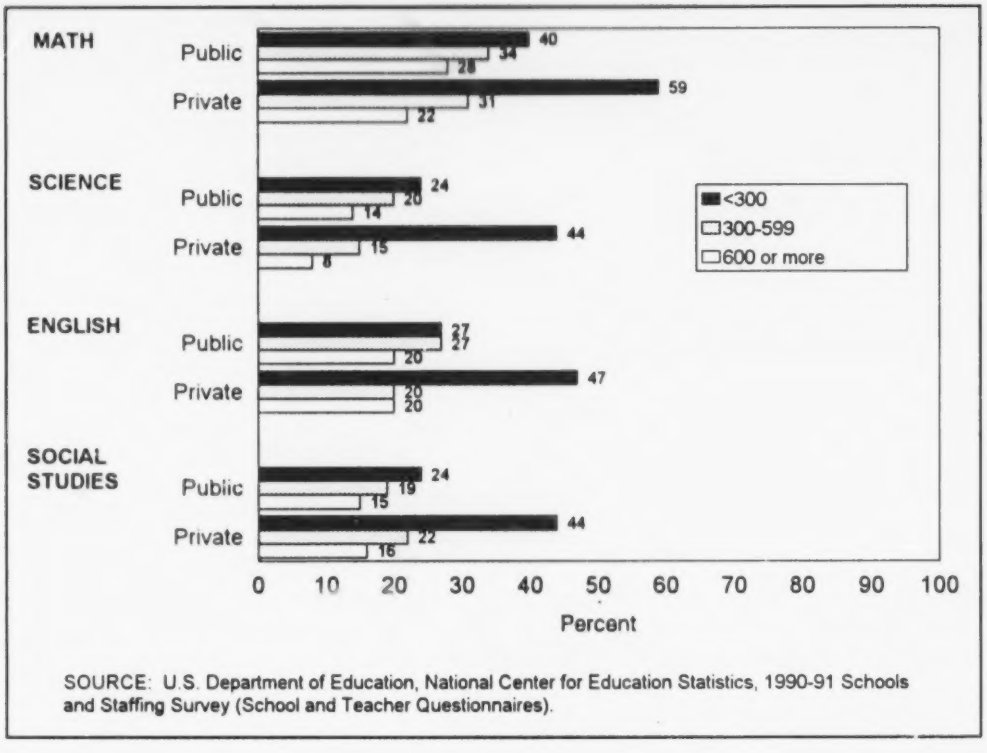


SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (School and Teacher Questionnaires).

However, one of the most important sources of variation in the amount of out-of-field teaching was school size. Within each sector, school size was related to out-of-field teaching. Small schools in both the public and private sectors (with fewer than 300 students) had higher levels of out-of-field teaching in each of the core academic fields than did large schools (with 600 or more students) (figure 2.3). For instance, small private schools had almost 60 percent of high school mathematics and 47 percent of high school English teachers out of field. On the other hand, large public schools had 28 percent out-of-field teachers in mathematics and 20 percent in English.

Different states also showed wide variation in the degree to which their public school teachers were assigned to teach out of field. Table 2.5 presents out-of-field teaching levels for public schools, by state. For example, in Alaska, California, and Hawaii, one-half or more of the public high school mathematics teachers taught out of field. On the other hand, in Connecticut, less than 12 percent of mathematics teachers taught out of field. For another example, in New Mexico, 41 percent of public high school English teachers taught out of field. On the other end of the scale were New Hampshire, Minnesota, and North Dakota, with less than 10 percent of English teachers teaching out of field.

Figure 2.3— Percentage of high school teachers who taught one or more classes in a core field without at least a minor in that field, by school sector and size: 1990-91



SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (School and Teacher Questionnaires).

The data in tables 2.3 and 2.4 indicate that substantial numbers of teachers were assigned to teach out of field. However, previous data (in column 6 of tables 2.1 and 2.2) also indicate that in most cases, the average amount of out-of-field teaching by each teacher was quite limited. Together, these data suggest that many teachers taught a few classes out of field, although probably only a few teachers taught many classes out of field. These data, however, do not indicate how many classes were taught out of field nor do they distinguish how large out-of-field class sizes were. Hence, it is unclear what proportion of the student population was taught by underqualified teachers.

In order to illustrate how many students received their education from underqualified teachers, table 2.6 shows the percentages of students enrolled in classes taught by teachers who did not have at least a minor in the field. In general, the proportions of students receiving out-of-field teaching were lower than the proportions of teachers teaching out of field (displayed in tables 2.3 and 2.4) again suggesting that either, on average, teachers taught only one or two classes out of field or that out-of-field classes were smaller. Nevertheless, these proportions represented large numbers of students.

Table 2.5— Percentage of *public* high school teachers who taught one or more classes in a field without at least a minor in that field, by field and *state:* 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/ Music	Phys. Ed.
Total Public	30.5	16.9	*16.9	21.9	15.4	19.0	15.4	14.6
Alabama	21.2	18.6	22.2	22.6	-	20.1	22.1	7.2
Alaska	63.3	22.3	34.9	27.7	-	38.1	-	48.5
Arizona	30.7	17.8	21.0	21.2	-	14.9	26.2	21.5
Arkansas	20.2	14.6	25.3	21.9	-	11.6	6.6	8.9
California	51.0	18.2	16.2	29.0	22.5	27.5	20.1	33.3
Colorado	35.1	18.4	21.6	20.8	13.2	15.8	14.2	10.3
Connecticut	11.1	4.6	14.7	13.0	0.0	27.4	-	-
Delaware	-	-	-	-	-	-	-	-
Dist. of Columbia	-	-	-	-	-	-	-	-
Florida	38.8	29.6	20.7	16.6	-	30.7	26.5	10.9
Georgia	35.0	21.7	19.6	21.4	22.0	22.3	-	22.6
Hawaii	50.6	-	-	-	-	-	-	-
Idaho	24.5	9.7	18.3	19.1	-	14.3	26.2	11.7
Illinois	27.5	16.8	20.1	26.0	8.0	16.2	8.5	5.9
Indiana	29.7	15.3	5.5	12.9	24.0	13.1	9.4	8.3
Iowa	18.0	21.6	8.8	16.5	17.7	6.2	12.7	16.7
Kansas	13.0	17.7	25.6	24.0	-	8.5	6.4	8.3
Kentucky	17.4	19.8	11.2	19.2	-	8.3	15.4	-
Louisiana	30.9	24.2	19.8	23.8	-	12.4	-	17.3
Maine	32.9	19.8	15.2	27.4	-	21.8	24.0	-
Maryland	39.6	22.6	19.0	29.7	-	28.2	-	-
Massachusetts	36.8	16.7	14.3	15.9	10.5	44.2	-	-
Michigan	32.8	22.1	20.0	25.3	-	13.9	16.6	14.6
Minnesota	14.2	8.3	14.1	7.1	9.5	6.9	9.4	9.6
Mississippi	22.8	9.2	12.8	20.4	-	23.9	8.6	15.5
Missouri	14.9	22.9	13.8	19.6	22.3	15.3	15.0	18.9
Montana	13.6	21.7	12.9	15.8	20.7	12.1	16.2	7.1
Nebraska	26.2	10.8	22.3	20.7	-	6.7	14.1	19.1
Nevada	37.3	-	20.9	25.3	-	23.4	-	-
New Hampshire	-	-	-	2.1	-	-	-	-
New Jersey	33.6	19.7	15.3	25.0	9.3	20.6	17.3	8.9
New Mexico	47.1	43.9	19.6	41.0	-	13.7	-	16.7
New York	33.5	12.5	12.9	23.6	8.5	19.9	16.1	3.6
North Carolina	23.7	8.1	18.0	24.2	-	19.2	18.1	10.3
North Dakota	21.2	7.8	13.7	7.6	19.4	7.9	7.0	9.6
Ohio	17.1	9.8	13.3	15.6	-	23.8	8.8	-
Oklahoma	34.2	23.9	24.8	21.7	24.5	5.9	18.2	23.0
Oregon	33.4	11.0	26.9	28.8	-	13.6	24.8	18.5
Pennsylvania	14.4	9.6	11.6	19.8	9.8	18.6	11.5	2.9
Rhode Island	-	-	-	-	-	-	-	-
South Carolina	28.7	22.0	13.5	13.0	-	27.2	11.3	19.7
South Dakota	19.7	13.9	24.6	27.7	15.8	10.8	12.5	20.8
Tennessee	27.8	26.4	26.8	27.0	15.6	24.2	21.0	16.5
Texas	30.4	13.9	16.3	18.2	26.4	23.6	18.1	12.2
Utah	43.7	11.7	22.4	24.8	19.5	16.3	26.3	12.5
Vermont	-	-	-	12.9	-	-	-	-
Virginia	34.0	14.0	13.9	16.7	2.2	11.2	10.1	-
Washington	46.0	24.3	17.6	28.9	9.7	23.2	29.1	33.3
West Virginia	16.0	17.1	32.2	32.9	-	13.0	16.6	6.1
Wisconsin	16.5	16.5	4.9	18.2	-	10.3	7.8	2.4
Wyoming	24.9	8.3	27.8	16.7	-	9.1	20.0	4.5

- Too few cases for reliable estimate

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

Table 2.6- Percentage of high school *students* enrolled in classes taught by teachers without at least a minor in the field, by field and selected *school* characteristics: 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/ Music	Phys. Ed.
Total Overall	21.1	11.2	11.0	14.7	12.2	16.5	7.4	8.6
Public	20.5	10.2	9.7	13.8	11.8	16.0	6.7	6.5
Size								
Less than 300	26.6	16.7	14.2	16.2	22.1	11.5	5.5	9.1
300-599	20.8	11.1	11.4	17.7	11.8	12.9	2.8	7.3
600 or more	20.1	8.8	8.9	13.1	11.0	17.5	8.1	5.6
Community								
Rural/sm. town	19.0	10.0	9.9	13.8	15.7	13.9	5.1	5.9
Urban fringe/lg. town	21.6	10.4	10.9	14.0	7.6	17.5	6.4	7.8
Central city	21.9	8.5	7.8	14.7	10.7	18.9	10.5	5.0
Minority Enrollment								
0-19%	16.2	9.8	8.8	13.0	9.8	12.9	5.0	5.4
20% or more	25.1	9.8	10.8	15.4	14.3	20.1	9.8	7.5
Free-Lunch Recipients								
Less than 20%	18.8	7.7	9.3	12.1	8.3	16.7	6.9	5.6
20-49%	23.4	12.6	11.1	16.5	20.9	14.4	5.8	6.8
50% or more	24.2	14.1	8.3	18.0	13.6	17.0	6.7	7.8
Private	25.9	19.5	22.2	22.7	14.0	30.6	15.2	27.7
Size								
Less than 300	41.4	28.7	34.3	37.7	17.9	45.4	15.2	48.1
300-599	23.2	8.0	19.1	15.2	13.5	38.8	10.8	15.6
600 or more	18.5	7.6	10.0	19.7	9.9	16.0	22.0	15.2
Community								
Rural/sm. town	34.4	32.1	43.8	30.1	11.0	25.5	21.3	65.2
Urban fringe/lg. town	23.7	7.5	9.2	13.9	11.5	31.8	9.3	15.0
Central city	25.7	16.2	18.8	27.2	13.2	34.9	18.0	22.7
Minority Enrollment								
0-19%	26.0	16.7	22.8	24.2	11.6	29.1	10.9	28.0
20% or more	26.3	12.8	14.4	19.7	14.3	39.7	27.4	22.0
Orientation								
Catholic	22.3	12.7	14.3	17.5	8.5	18.5	22.0	18.4
Other religious	35.8	24.9	31.1	32.0	35.8	62.1	15.6	43.8
Nonsectarian	22.8	12.1	20.2	22.1	7.4	28.7	2.4	19.1

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

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About 15 percent of all high school English students—2,245,655 of 15,234,000 high school students in this country—for example, were taught by teachers who did not have even a college minor in English, literature, speech, communications, journalism, English education, or reading education. Approximately 21 percent of all high school mathematics students, or 2,678,366 of 12,666,000 students, were taught mathematics by teachers who did not have a minor in mathematics or mathematics education. About 11 percent of high school science students, or about 1,202,000 of 10,700,000 students, were taught one of the sciences by a teacher that did not have at least a minor in any of the sciences or in science education. Eleven percent of high school social studies students, or about 1,357,000 of 12,400,000 students, were taught a social studies course by a teacher that did not have at least a minor in any of the social sciences, in history, in public affairs, or in social studies education.

These percentages varied by type of school. For instance, about one-quarter of the mathematics students in small public schools, and also about one-quarter in high-poverty public schools, were taught by out-of-field teachers. However, over 40 percent of the mathematics students in small private schools were taught by out-of-field teachers.

Summary and Implications for Research

Are the nation's high schools adequately staffed? This chapter assesses the basic education and training levels of teachers at the high school level and the fit between teachers' training and their teaching assignments. If one accepts the premise that adequate staffing requires high school teachers to hold at least a college minor in the fields they teach, then this analysis suggests that many of the nation's high schools were not adequately staffed in 1990-91. As a result, substantial numbers of high school students were taught by teachers who did not have a college minor in the field taught.

These inadequacies in staffing, however, varied greatly across different kinds of schools. Public schools with a greater proportion of poverty-level students had higher levels of out-of-field teaching in many fields at the high school level than did schools with lower percentages of poverty-level students (figure 2.2). However, school size was also an important factor. Small public schools had distinctly higher levels of out-of-field teaching in many fields than did large public schools (figure 2.3). It should be noted, however, that small schools represent a smaller proportion of the population than do large public schools. The former represent 28 percent of public schools serving high school students and about 11 percent of public school teachers at the high school level. On the other hand, large public schools represent almost half of the public high school population, and 69 percent of public school teachers at the high school level.

Private schools showed particularly wide variations in levels of out-of-field teaching at the high school level. For instance, differences were found between schools of different affiliations, especially between Catholic schools and other religious schools. Again, school size stood out as an important factor. Small private schools had among the highest average levels of out-of-field teaching of any schools (figure 2.3). However, unlike the public sector, small schools represent a larger proportion of the population than do large private schools. The former represent about half of all private schools serving high school students and about one-third of private school teachers

at the high school level. On the other hand, large private schools had among the lowest levels of out-of-field teaching of any schools. These represent about one-fifth of all private schools serving high school students and about one-third of private school teachers at that level.

Out-of-field teaching levels also differed distinctly among different types of teachers. In particular, recently hired teachers in both public and private schools were more often assigned to teach out of field in some fields (figure 2.1).

This analysis underscores the value of research focusing on the qualifications, in addition to the quantity, of the supply of teachers. It also underscores the importance of examining the manner in which teachers are utilized and assigned in schools. However, this analysis does not address the question of what the causes or sources of out-of-field teaching are, or its relationship to teacher shortages. However, it does shed some light on the debate concerning teacher supply, demand, and quality reviewed earlier in the chapter.

First, are staffing inadequacies, such as out-of-field assignments, due to inadequacies in the qualifications of the supply of teachers? That is, is out-of-field teaching a problem of poorly trained teachers? In fact, the data suggest that the prevalence of out-of-field teaching is not due to a lack of basic teacher training. Most high school teachers in the United States had completed a college education and, indeed, over half had acquired graduate degrees (tables 2.1 and 2.2). The inadequacies lay in the fit between teachers' fields of training and their teaching assignments. Many teachers were assigned to teach classes which did not match their education or training. Hence, increased and improved teacher training, while a worthwhile goal and the object of much current research and reform, may not reduce levels of out-of-field teaching.

On the other hand, are staffing inadequacies, such as out-of-field assignments, due to inadequacies in the quantity of the supply of teachers? That is, is out-of-field teaching a problem of too few teachers? In fact, the data presented in chapter 1 suggest that the supply of potential teachers in the larger population is both large and diverse (figure 1.1). Only a small proportion of newly hired teachers come directly from training institutions; a large proportion are either re-entrants or delayed entrants, suggesting that out-of-field teaching assignments are not due to insufficient numbers of trained teachers. For example, increasing enrollments in teacher training programs—the goal of some current education reforms—may not be an effective method of reducing levels of out-of-field teaching.

However, despite the large and diverse reserve pool and the widespread extent of basic training held by teachers, many school principals report experiencing difficulties in hiring qualified candidates and turning to the use of substitute teachers, in-school reassignments, and hiring of the underqualified as strategies for coping with these difficulties. Hence, although there may be many reasons for out-of-field assignments, a leading factor appears to be the inability of schools to obtain or retain sufficient numbers of candidates from the existing pool of trained teachers. However, the data do not establish the sources of this inability. For example, it is unclear if out-of-field teaching assignments are an emergency condition resulting from spot shortages of particular types of teachers at particular times in particular places, whether they are a short-term condition due to fiscal constraints in particular settings, or to what extent they are a chronic condition because this is a normal and ongoing practice in particular schools. Moreover, if most

out-of-field teaching is a remedy for difficulties in hiring, it is not at all clear whether it is the unwillingness of existing trained teacher candidates to seek positions, or whether the root of the problem is the unwillingness of schools to attract, effectively utilize, and retain existing trained teacher candidates, or both. All these questions warrant further investigation.[3]

These findings also have implications and raise questions for several other important streams of contemporary education research.

Equity is one of the central concerns of contemporary education researchers and policymakers (e.g., National Commission on Excellence in Education 1983). Concern centers around disparities in the resources and quality of schooling provided to different student subgroups. This analysis draws attention to differences in the distribution of one such resource—qualified teachers. These data suggest that poorer student populations more often receive less qualified teachers, raising questions about the impact of out-of-field teaching levels on the achievement of students from such schools.[4]

The difference between private and public schools is another central theme in much current education research. In particular, analysts have focused on the widespread differences in the ways public and private schools are organized and operated (e.g., Chubb and Moe 1990; Coleman and Hoffer 1987; Bryk, Lee, and Smith 1990). This analysis draws attention to distinct public-private differences in an important but overlooked aspect of school organization—the assignment and utilization of teachers. These data suggest, moreover, that private schools themselves vary greatly in this respect. Some were characterized by relatively high levels of underqualified teaching and some were characterized by relatively low levels.[5]

Another important debate in education policy research concerns the relative advantages and disadvantages of smaller and larger schools. Until recently, the view that "large is efficient" was prominent among many education policy researchers. These analysts argued that consolidation of smaller schools into larger units was a more efficient and effective manner of utilizing resources because of economies of scale (e.g., Conant 1959). Currently, a counter view that "small is beautiful" has gained popularity among many education policy researchers. In this view, school effectiveness is deeply affected by the degree of cohesion and belongingness—in short, community—among students and staff within schools. These analysts argue that large schools are more impersonal, alienated, inflexible, bureaucratic and, hence, have less sense of

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[3] A more detailed analysis of SASS data is currently being undertaken on the levels of and variations in teaching vacancies, hiring difficulties, unfilled positions, training, and salary incentives and their relationships to levels of out-of-field teaching. (For a discussion of preliminary findings, see Ingersoll 1995b.)

[4] NCES is currently sponsoring a follow-up project using SASS data to examine in more detail the extent of inequalities in the distribution of qualified teachers across different student populations both within and across schools. (For a preliminary discussion of the findings, see Ingersoll and Hill 1995.)

[5] NCES is also sponsoring a follow-up project utilizing SASS data to examine in more detail the variations in a range of organizational characteristics among private schools. (For a preliminary discussion of the project, see Baker 1995.)

community. In this view, large schools are less effective places for students to learn and grow (Bryk et al. 1990).

This analysis draws attention to a distinct difference between large and small schools—the degree to which staff are assigned to teach out of their fields of training. The data show that large schools in both the public and private sectors have lower levels of out-of-field teaching than small schools. This suggests that one disadvantage of small schools, often overlooked in the debates over the relative merits of small and large, may be a greater degree of underqualified teaching.

The state of mathematics and science education achievement in the United States is another important topic in contemporary education research. There is a growing constituency who have looked to mathematics and science education as a key example of what is wrong with the American education system, and hence, a target for education reform (Darling-Hammond and Hudson 1990; Murnane and Raizen 1988). This analysis draws attention to the high levels of out-of-field teaching in mathematics and raises questions for further research—what is the impact of teacher background on student achievement?

Finally, another topic of interest in current education research is the difficulty new teachers face in their jobs (e.g., Sclan 1993). Researchers have advocated a range of reform efforts, such as mentoring, apprenticeship, and induction programs, designed to aide new teachers and cut down on their high attrition rates. This analysis draws attention to one possible set of problems confronting new teachers—their higher levels of out-of-field teaching. This raises questions for further research—why are new teachers more often assigned out of field than experienced teachers, and what effect does it have on them and their students?

3 Teacher Turnover

This chapter turns to an analysis of one of the key factors influencing the supply and demand balance—turnover, or the rate at which teachers exit schools. Turnover, as illustrated in the flow chart (figure 1.1), is multifaceted—consisting of both teacher migration (i.e., those who move to teaching jobs in other schools) and teacher attrition (i.e., those who leave the profession altogether). As the chart also shows, turnover is a very significant phenomenon and accounts for a large portion of both shifts in the quantity of demand for new teachers and changes in the quantity of teachers supplied. This raises a number of questions of importance to school policy and practice, concerning who exits, why they do so, and from where they exit.

Over the past decade, substantial research has been directed to answering the first two questions—who exits and why they do so (e.g., Grissmer and Kirby 1987; Haggstrom et al. 1988; Murnane 1981, 1987; Murnane, Singer, and Willett 1988; Heyns 1988; Hafner and Owings 1991; Murnane et al. 1991; Bobbitt et al. 1991, 1994; Chapman and Hutcheson 1982; Chapman and Green 1986; Weiss and Boyd 1990; Arnold et al. 1993). Researchers have shown that teacher retention, attrition, and turnover significantly differ among different types of teachers, depending upon age, experience, sex, race, education, specialty field, and salary. Experience, in particular, has stood out as a salient factor. The relationship between teaching experience and attrition has been found to follow a U-shaped curve—the most junior and the most senior teachers tend to leave at far higher rates. Moreover, these studies have also shown that teachers' life circumstances, marital status, number of children, and personal values affect the likelihood of staying with or leaving their jobs. As a result, such research has provided a great deal of insight as to who exits from teaching jobs, why they do so, and what implications this may have for assessments of teacher supply and the potential of shortages of particular types of teachers.

Much less research has been undertaken to answer the third question—from where do teachers move or leave—and to identify the effects of school characteristics on teacher turnover. Most research on teacher attrition and turnover has been conducted at an individual level of analysis. That is, researchers have generally sought to explain teachers' individual choices to stay, move, or leave as a function of the characteristics of individual teachers. The focus typically is on what kinds of personal factors shape each teacher's individual career decisions. Where school effects are examined, they are generally limited to controls for whether the teachers' schools are public or private, elementary or secondary, rural, suburban, or urban (e.g., Heyns 1988). Others have focused solely on specific kinds of "problem" schools, especially urban, poor public schools, which are often found to have very high rates of turnover (Rosenholtz 1985). For the most part, researchers have not focused on the extent to which levels of turnover differ across types of schools nor have they explored what school characteristics are related to teacher turnover.[6]

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[6] Two notable exceptions to this general trend are Theobald's (1990) study of predictors of teacher attrition from public school districts in Washington state and Sclan's (1993) dissertation using national data to analyze the determinants of beginning teachers' plans to remain in teaching.

As a result, it is unclear to what extent the overall turnover of teachers may be disproportionately concentrated in particular types of schools or what about schools themselves is related to turnover. This gap in available information was highlighted by participants at the 1991 NCES Conference on Teacher Supply, Demand, and Quality (see for instance, Barro 1992), and it is the objective of this chapter to address these issues.

An examination of teacher turnover at the school level is important for reasons of both theory and policy. First, there is a long tradition of research among those who study occupations and professions in general that shows employee turnover is substantially affected by organizational-level factors (e.g., Halaby and Weakliem 1989; Price 1977; Bluedorn 1982; Mueller and Price 1990). For instance, researchers have shown that in addition to individual and personal characteristics of employees, the overall conditions of workplaces and job sites significantly affect the attachment of employees to the organization. Among the most important of these collective characteristics are the degree of conflict and strife in the organization; the extent of opportunities for promotion; the level of support and assistance available, especially for new employees; and the presence of working conditions typically associated with the professions, such as high levels of employee autonomy, substantial employee input into organization policies, and the availability of opportunities for growth and training. It is reasonable to expect that many of these organizational and workplace factors may be important factors affecting the overall rates at which teachers exit particular schools.

Second, school-level research on teacher turnover is important because of what it may mean for the functioning and quality of schools. As in other kinds of organizations, high turnover of employees from schools is of concern not simply because it may be an indicator of sites of potential staffing shortages, but because of its relationship to organization performance (see, for example, Price 1989). It is important to ask why particular schools have higher turnover. What does a high rate of turnover imply about the attractiveness of particular schools as workplaces for teachers? In turn, it is important to consider what effect high levels of teacher entry, transfer, and exit have on schools. How do schools cope, for example, with a recurring loss of staff and a recurring need to rehire? How does a high rate of turnover affect the ability of staff to develop a coherent curriculum across grades and teachers?

Research on effective schools has shown that one of the most important indicators of a successful school is the presence of a sense of community (e.g., Coleman and Hoffer 1987; Bryk et al. 1990; Kirst 1989). The "good" school, in this view, is marked by stability, continuity, and cohesion. Most of this research has tended to emphasize the degree of cohesion between schools and families. However, the cohesion between schools and teachers is also undoubtedly an important aspect of school community. Hence, identification of the types of schools with low turnover is one method of identifying the types of schools with a positive sense of community. Of course, some staff turnover is unavoidable, normal, and even beneficial. Schools lose teachers for a host of reasons including lay-offs, involuntary transfers, career moves, terminations, retirements, and individual family concerns (Bobbitt et al. 1994). However, regardless of reasons, high rates of teacher turnover are of concern not only because they may be an indication of underlying problems in how well schools function, but also because they can be disruptive, in and of themselves, for the quality of school community.

The objective of this chapter is to examine the extent to which schools themselves vary in their rates of teacher turnover. Rather than examine which kinds of teachers are more likely to leave a school, this analysis examines which kinds of schools have more turnover. The analysis focuses on a series of school-level factors and characteristics, suggested by the research literature and available from SASS. These include: characteristics of schools, composition of faculties, faculty compensation levels, and working conditions in schools.

This analysis addresses two sets of questions:

1. *What characteristics of schools are associated with teacher turnover?*

   - How much do turnover rates vary between public and private schools?
   - Do poor, urban public schools have particularly high levels of teacher turnover?
   - Do teachers' working conditions make any difference in the levels of teacher turnover?
   - Are teacher salary levels related to turnover?
   - Within the private sector, is the orientation or affiliation of the school associated with teacher turnover?

2. *Do particular types of schools bear the brunt of teacher turnover? What are the actual levels of teacher turnover at different types of schools and in different states?*

Methods and Measures

This analysis focuses on teacher turnover from each school, regardless of whether the exiting individual remained within the district, moved to another school elsewhere, or remained in education. In each case, turnover means a decrease in teaching staff for that particular school. The school turnover rate is based on school administrators' reports of the percentage of teachers, both full time and part time, who left positions in their schools in the 12 months prior to October 1990. It is drawn from the School Questionnaire of the 1990-91 SASS. This rate includes those who migrated to teaching positions in other schools (movers) and those who left the occupation entirely (leavers). The school sample utilized in the analysis includes 8,969 public schools and 2,620 private schools.

The objective of this analysis is to examine differences in the rate of turnover across different types of schools. The variables to be explored include: key characteristics of schools (sector, size, urbanicity, and level); the level of poverty or affluence of the student population served by the school (recipients of free lunch in public schools, tuition levels in private schools); some key demographic characteristics of school faculties (levels of education, training, experience, and race); basic elements of faculty compensation packages (school salary schedule, paid benefits provided); and important aspects of the working conditions in schools. The latter

include measures of school climate (levels of student discipline problems), of how decentralized the working environment is (the degree of faculty control and influence over policies and decisionmaking), and of opportunities for professional advancement, growth, and training (merit pay, support for retraining, mentor or master programs, and reimbursement for continuing education).

The analysis explores which, if any, of the above school characteristics and conditions are related to levels of turnover in schools, and establishes what the levels of turnover are in these different settings. It should be noted, however, that this list of factors is not exhaustive, nor is it designed to provide a comprehensive explanation of teacher turnover. Many other possible factors could influence school rates of turnover. For example, the analysis is only able to examine a limited selection of the range of school working conditions and types of teacher professional development programs that exist. Moreover, the emphases of the available measures vary. Several of the measures (e.g., merit pay plan, mentor/master program, retraining, education) are dichotomous and simply indicate whether a school has the program or not; they do not indicate anything about the quality or type of program. On the other hand, other measures (e.g., faculty influence, student discipline problems) are more evaluative. But these, of necessity, must rely on respondents' subjective perceptions. Figure 3.1 provides definitions for all the variables used in the multiple regression analysis. Table 3.1 displays summary statistics for these measures. Further discussion of the construction, strengths, and limitations of the measures are provided in the Technical Notes.

The analysis proceeds by exploring whether turnover rates are statistically associated with this set of school-level characteristics and variables. The analytic method is ordinary least squares multiple regression. The objective of this method is to explore the relative association of each of these variables with school rates of teacher turnover. That is, the statistical association of each variable with turnover is individually determined, while the other variables are held constant, or, in other words, are considered to be equal or controlled.

The following section displays and discusses the results of the multiple regression analysis. In the multiple regression tables, the numbers displayed for each variable, known as coefficients, represent estimates of the association of each variable with turnover, after taking account of the other variables. It should be noted that the relationships depicted and discussed between the variables and turnover do not imply causality. Moreover, the coefficients must be interpreted with some caution because, as expected, the selected variables only explained a portion of the variation in teacher turnover from schools. However, this analysis does show that turnover rates distinctly varied across types of schools and that particular characteristics and conditions showed a strong association with turnover.

Figure 3.1— Measures used in the multiple regression analysis

School Characteristics

- **Private**: a dichotomous variable where 0 = public and 1 = private
- **Size**: student enrollment of school
- **Urban fringe/large town**: a dichotomous variable where 0 = rural/small town or central city and 1 = urban fringe/large town
- **Central City**: a dichotomous variable where 0 = rural/small town or urban fringe/large town and 1 = central city
- **Secondary Level**: a dichotomous variable where 0 = elementary/combined and 1 = secondary

For private schools:

- **Catholic**: a dichotomous variable for school orientation where 0 = other religious or nonsectarian and 1 = Catholic
- **Nonsectarian**: a dichotomous variable for school orientation where 0 = other religious or Catholic and 1 = nonsectarian
- **Student Tuition**: the highest annual tuition for full-time student, excluding boarding fees. This is only an imperfect measure of level of affluence of student population because some private schools offer scholarships and financial aid programs for nonaffluent students.

For public schools:

- **% Free-Lunch Recipients:** percentage of students receiving the federal free or reduced-price lunch program
- **District Size**: student enrollment of school district

Faculty Characteristics

- **% Beginning**: percentage of faculty with less than 3 years of total teaching experience
- **% Senior**: percentage of faculty with greater than 20 years of total teaching experience
- **% M.A. degree**: percentage of faculty with graduate degrees (master's or beyond)
- **% Certified**: percentage of faculty holding regular certification. For the public sector, percentage certified represents the percentage of the school *district's* faculty that held certification.
- **% Minority**: percentage of faculty that are minority

Basic Compensation Levels

- **Maximum Salary**: base-year salary for teacher at maximum possible step on salary schedule
- **Paid Benefits**: on a scale of 0 - 3, the sum of three different possible paid benefits—medical, dental, retirement plans. This measure indicates only whether a school offers a paid plan in each of the three areas; it does not account for differences in the worth or coverage of plans.

Working Conditions

- **Merit Pay Plan**: a dichotomous variable where 1 = availability of merit pay for performance program
- **Mentor/Master Program**: a dichotomous variable where 1 = availability of formal mentor or master teacher program to help new teachers
- **Retraining Support**: a dichotomous variable where 1 = availability of free retraining to prepare teachers to teach in fields of current or anticipated shortages
- **Education Support**: a dichotomous variable where 1 = reimbursement available for teachers' tuition and course fees for additional college coursework
- **Faculty Influence**: on a scale of 1 = none to 6 = a great deal, the school mean of faculty control and influence over 10 areas. This is a composite measure derived from factor analysis of teachers' reports.
- **Student Discipline Problems**: on a scale of 1 = not a problem to 4 = serious, the school mean of teachers' reports for 12 kinds of student misbehavior and disruption. This is a composite measure derived from factor analysis of teachers' reports.

For more details on the definition and construction of these measures see the Technical Notes.

Table 3.1— Means of teacher turnover and selected characteristics, by school sector: 1990-91

	All Schools	Public Schools	Private Schools
Characteristics			
% Teacher Turnover	10.4	8.7	15.8
School Size	428.2	502	189.3
% Central City	27	23	38
% Urban Fringe/Lg. Town	27	26	31
% Secondary Level	21	25	10
Public District Size	.	34,715	.
% Free-Lunch Recipients	.	33.5	.
% Catholic Private	.	.	35
% Nonsectarian Private	.	.	18
Private Student Tuition ($)	.	.	2,504
% Beginning Faculty	14.2	12.2	20.5
% Senior Faculty	18.8	21	11
% Faculty with M.A.	39.6	44	25.5
% Faculty Certified	90.8	98.3	68.1
% Minority Faculty	11.1	12	8.2
Maximum Salary ($)	35,590	39,348	23,719
Paid Benefits (scale: 0-3)	2.4	2.6	1.7
% with Merit Pay Plan	12	13	11
% with Mentor/Master Program	58	66	32
% with Retraining Support	17	18	16
% with Education Support	36	36	39
Faculty Influence (scale: 1-6)	4.5	4.5	4.7
Student Discipline Problems (scale: 1-4)	1.7	1.8	1.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Public District, School, and Teacher Questionnaires).

Results

Table 3.2 presents four multiple regression models that progressively cumulate the effects of the groups of variables to be explored. The addition of each group of variables one step at a time allows comparison of the variation in turnover accounted for by each group. It also allows a determination of whether the relationship of particular variables with turnover diminishes as new variables are added to the model.

When school characteristics are considered as a group (model 1 of table 3.2), school sector and school size stand out as key variables. In private schools, teachers moved out at significantly higher rates. For instance, the private school teacher turnover rate was about 6 percent higher than the public school rate. Moreover, in smaller schools, teachers moved out at significantly higher rates than in larger schools. For instance, schools larger by 100 students had, on average, .4 percent less turnover. In addition, urban schools had slightly higher turnover rates than rural/small town schools. Finally, little difference was found in turnover between secondary schools and elementary or combined schools.

Model 2 of table 3.2 adds a series of measures of faculty demographic characteristics to the analysis. It clearly shows that some aspects of the composition of school faculties were related to rates of turnover, once school characteristics were held constant. Especially striking was the relationship between turnover and the overall experience levels of the faculty. Schools with a larger proportion of beginning teachers had higher rates of turnover than those with smaller proportions, even after accounting for school characteristics. On the other hand, the proportion of faculty with over 20 years of experience was not significantly related to turnover. In addition, schools with more faculty with advanced degrees had lower rates of turnover than those with fewer faculty holding advanced degrees. Finally, schools with more minority teachers had higher teacher turnover rates than schools with few minority teachers. In neither of the latter two cases, however, was the relationship strong.

Again, these results do not imply causality. Beginning teachers, for example, may be more likely to exit, but schools with high turnover may also be more likely to need to hire new teachers, increasing the proportion of new faculty. Moreover, such results do not necessarily mean that all new teachers more readily opted out. The relationship is between collective characteristics of faculty and collective rates of turnover.

At least some of the different characteristics of faculties also seemed to have been related to the higher rates of turnover in private schools. Once faculty characteristics were introduced in model 2, the private school coefficient, while still statistically significant, decreased substantially. In other words, it appears that part of the reason that private schools had higher turnover than public schools was due to differences in the composition of their faculties.

Table 3.2— Multiple regression analysis of teacher turnover: 1990-91

	Model 1		Model 2		Model 3		Model 4	
	(b)	(se)	(b)	(se)	(b)	(se)	(b)	(se)
School Characteristics								
Private	5.7*	.69	3.3*	.77	2.0*	.92	3.1*	.86
Size (x 100)	-.39*	.05	-.34*	.05	-.3*	.05	-.37*	.05
Central City	1.4*	.64	1.6*	.6	2.2*	.56	1.5*	.67
Urban Fringe/Lg. Town	.06	.53	1.1*	.51	1.8*	.46	1.45*	.46
Secondary Level	.33	.26	1.2*	.28	1.1*	.28	.69*	.28
Faculty Characteristics								
% Beginning			.3*	.03	.3*	.03	.29*	.03
% Senior			-.01	.01	-.004	.01	-.01	.01
% M.A. Degree			-.02*	.01	-.01*	.01	-.01	.01
% Certified			.01	.02	.01	.02	-.01	.02
% Minority			.02*	.01	.017	.01	.01	.01
Basic Compensation Levels								
Maximum Salary (x 10,000)					-.83*	.40	-.53	.34
Paid Benefits					-.31	.49	-.39	.56
Working Conditions								
Merit Pay Plan							1.1	.57
Mentor/Master Program							-.31	.44
Retraining Support							.46	.43
Education Support							-.67	.36
Faculty Influence							-1.3*	.38
Student Discipline Problems							.98*	.45
Intercept	10.3*	.39	5.8*	1.99	9.1*	2.71	14.7*	3.82
R^2	.06		.17		.16		.18	
N	11,589		11,015		10,965		10,187	

* $p < .05$

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Public District, School, and Teacher Questionnaires).

Moreover, at least some of the characteristics of faculties seemed to have been related to the relationships between rates of turnover and school locale and level. Once faculty characteristics were introduced in model 2, the relationship between both suburban locale and school level with turnover increased. In other words, once differences in faculty composition were held constant, schools located in the suburban fringe of cities or in large towns had slightly higher turnover rates than did schools in rural areas or in small towns. The same holds for secondary schools; they also had slightly higher turnover rates than did elementary or combined schools, once differences in faculty composition were held constant.

Model 3 of table 3.2 adds two elements of basic faculty compensation packages to the analysis. Notably, the maximum teacher salary exhibits a small coefficient; that is, after the other variables were held constant, the maximum salary a school offered was only moderately associated with a decrease in turnover rates. For instance, schools with maximum salaries, larger by $20,000, had, on average, 1.6 percent less turnover. In addition, the number of benefits paid for by the school was not significantly related to turnover. Moreover, once the two compensation variables were introduced in model 3, the private school coefficient decreased, but not to a statistically significant extent. In other words, it appears that higher turnover rates in private schools were not accounted for by differences in these two types of basic compensation.[7]

Finally, model 4 of table 3.2 presents the full set of variables. Of the first three groups of variables, the predictors of turnover that were the strongest and the most stable across models were school sector, school size, and percentage beginning faculty. Model 4 also shows that some aspects of school working conditions were related to turnover, after other characteristics were taken into account. A key condition related to turnover was the degree of overall faculty influence and control over school decisionmaking. In schools where teachers reported lower levels of control and influence, turnover rates were distinctly higher. For example, schools reporting the minimum level of faculty influence had, on average, 6.5 percent more turnover than those schools reporting the maximum level of faculty influence. Moreover, a second aspect of the working environment of schools—teachers' reports of student misbehavior—was also important. Higher levels in reported student discipline problems were associated with distinctly higher levels of turnover. Notably, however, the provision of several employee professional development programs—mentor/master plans, merit pay plans, and support for retraining—were not statistically associated with turnover.

Table 3.3 presents separate models of turnover for public and private schools. It examines in more detail what accounts for differences in turnover within each school sector and to what extent the association of these variables with turnover differs across sectors.

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[7] In a series of background analyses, we also explored the relationship between turnover and two other available salary schedule measures: mean school starting salary (bachelor's degree and no experience), and mean school mid-career salary (master's degree and 20 years experience). When substituted in the models, both had a weaker relationship with turnover than did maximum salary. In addition, we explored whether adjusting the salary measures for cost-of-living differences across states and counties made a significant difference in the effect of salaries on turnover; it did not. Hence, the analysis presented here utilizes unadjusted measures of maximum salary.

Notably, poor, urban, public schools did not appear to have substantially higher rates of turnover than other kinds of public schools. Having a high proportion of poverty-level students was not significantly associated with increased teacher turnover. Both suburban and urban public schools had slightly higher turnover than rural schools. Secondary schools also had slightly higher turnover than elementary or combined schools. As before, however, school size and also school district size were inversely related to turnover in public schools. In smaller schools, teachers moved out at significantly higher rates. For instance, public schools larger by 100 students had, on average, .3 percent less turnover.

In private schools, neither student tuition levels nor the affiliation or orientation of schools were significantly associated with turnover. As in public schools, a key factor related to teacher turnover rates was school size. For instance, a difference in 100 students in school enrollment was associated with a 1 percent difference in teacher turnover in private schools. In both private and public schools, the proportion of the school faculty that was new to teaching was clearly related to the rates of turnover.

Finally, many of the indicators of working conditions were not strongly associated with turnover in either public or private schools. The main exception was the degree of overall faculty influence and control over school decisionmaking, which was an important factor in both public and private schools. Finally, and perhaps surprisingly, public schools with merit pay plans had slightly higher teacher turnover rates than those without such plans.

To illustrate the actual levels of turnover in different kinds of schools, figure 3.2 presents mean turnover rates for several basic school types. Parallel to the regression analysis, there are distinct differences in rates of turnover between public and private schools and between small (fewer than 300 students) and large schools (600 or more students). Private schools had almost double the turnover rate of public schools, and moreover, within each sector, smaller schools had higher rates of turnover than did larger schools. On one end of the scale lie the larger public schools with the lowest average turnover rate—8 percent. Larger public schools represent 22 percent of all schools and 43 percent of all teachers in the United States. On the other end of the scale lie smaller private schools. Smaller private schools represent 81 percent of all private schools and 56 percent of all private school teachers in the United States. In rates of turnover, smaller private schools had the highest average levels—17 percent.[8]

[8] These school population proportions are estimates derived from SASS.

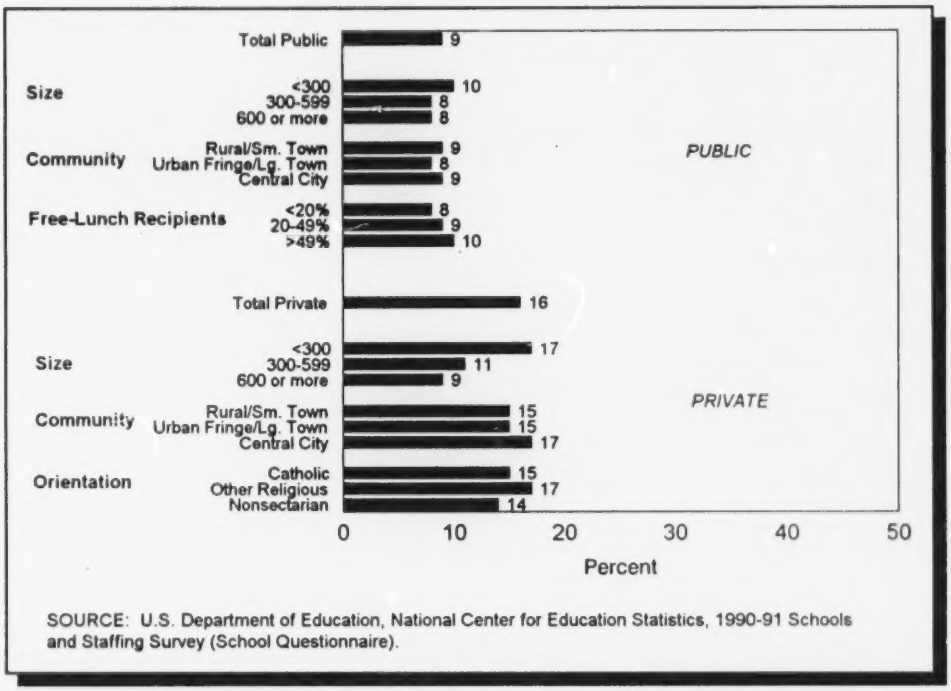
Table 3.3— Multiple regression analysis of teacher turnover: 1990-91

	Public		Private	
	(b)	(se)	(b)	(se)
School Characteristics				
Size (x 100)	-.3*	.05	-1.0*	.26
Central City	1.1*	.52	3.4	2.4
Urban Fringe/Lg. Town	1.04*	.49	2.4	1.8
Secondary Level	.91*	.36	.54	1.25
Public District Size (x 10,000)	-.05*	.01		
% Free-Lunch Recipients	.005	.01		
Catholic Private			-.4	1.49
Nonsectarian Private			-1.1	2.3
Private Student Tuition (x 1000)			.02	.16
Faculty Characteristics				
% Beginning	.27*	.03	.32*	.06
% Senior	-.01	.01	-.01	.07
% M.A. Degree	-.001	.01	-.05	.03
% Certified	-.25	.16	.03	.03
% Minority	.02	.02	-.002	.03
Basic Compensation Levels				
Maximum Salary (x 10,000)	-.42	.33	.32	1.03
Paid Benefits	.01	.32	-.59	.93
Working Conditions				
Merit Pay Plan	1.2*	.39	.72	2.68
Mentor/Master Program	-.39	.38	.76	1.3
Retraining Support	.5	.39	-.49	1.47
Education Support	-.54	.3	-1.2	1.39
Faculty Influence	-1.1*	.3	-1.6*	.73
Student Discipline Problems	.76*	.37	-.28	1.89
Intercept	36.*	17.37	18.*	5.67
R^2	.14		.15	
N	7,944		2,108	

* $p < .05$

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Public District, School, and Teacher Questionnaires).

Figure 3.2— Mean teacher turnover, by selected characteristics: 1990-91



SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (School Questionnaire).

Table 3.4 presents state teacher turnover rates for public schools. These data indicate the range of variation across the 50 states in the average levels of teacher turnover from public schools. In Alaska and Nebraska, the public schools, on average, turned over one-fifth or more of their staffs in 1990-91. Connecticut, Michigan, Hampshire, New Jersey, New York, and Pennsylvania all had average school turnover rates of 6 percent or less.

Table 3.4— Mean teacher turnover in *public* schools, by state: 1990-91

	% Teacher Turnover
Total Public	8.7
Alaska	26.3
Nebraska	20.0
Rhode Island	13.8
New Mexico	13.1
South Dakota	12.9
Texas	12.8
Nevada	12.7
Idaho	11.2
Louisiana	10.9
Arizona	10.6
Oklahoma	10.6
Vermont	10.4
Maryland	10.1
Florida	10.0
Georgia	10.0
West Virginia	10.0
California	9.7
Virginia	9.6
Wyoming	9.5
Washington	9.4
Oregon	9.3
Kansas	9.3
South Carolina	9.3
North Dakota	9.2
Hawaii	9.1
Colorado	9.1
Delaware	8.8
Alabama	8.8
North Carolina	8.6
New Hampshire	8.6
Arkansas	8.5
Massachusetts	8.5
Utah	8.4
Missouri	8.2
Tennessee	7.6
Maine	7.4
Mississippi	7.4
Montana	7.4
Wisconsin	6.9
Minnesota	6.7
Illinois	6.6
Ohio	6.6
Dist. of Columbia	6.4
Iowa	6.4
Kentucky	6.2
Indiana	6.2
Connecticut	6.0
New York	5.7
Michigan	5.4
New Jersey	5.4
Pennsylvania	4.9

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (School Questionnaire).

Summary and Implications for Research

This analysis examines teacher turnover at the school level. The results indicate that the flows of teachers out of different kinds of schools were not equally distributed in 1990-91. The analysis highlights the types of schools that had distinctly higher rates of turnover. These findings have important implications for several important streams of contemporary education research.

Determining what makes schools effective is a central topic in current education research. Currently, there is near consensus that one of the most important indicators of the effective school is the presence of a sense of community. Typically, large, urban public schools serving poor student populations are more often found to lack a sense of community. Small schools and private schools are both held to be far better places to work and learn because of their more communal, personal climates and their sense of continuity, cohesion, and belongingness (e.g., Coleman and Hoffer 1987; Bryk et al. 1990). If one accepts the premise that high teacher turnover is an indicator of where community, cohesion, and continuity have broken down, the results in this analysis raise serious questions for these views.

This analysis indicates that large, urban public schools serving poor student populations did not have the highest rates of turnover, after controlling for other factors. In contrast, the findings show small schools and also private schools having higher turnover rates. Schools that were both small and private, in particular, stand out. They lost, on average, about one-sixth of their faculty that year. In such cases, ostensibly, an entire staff could change within a school in only a short number of years.

This analysis does not establish the reasons why small and private schools had high rates of turnover, but it offers some ideas and raises some issues for further research. First, salary does not seem to provide an explanation. Although studies have shown that individual teacher's decisions to stay or leave their jobs are effected by their salary levels, surprisingly, this analysis has suggested that the lower pay scales in private schools are not a major factor in their relatively high turnover rates. Second, teacher characteristics, especially experience, may be part of the explanation. New teachers have been shown to be more likely to exit, and private schools had a larger proportion of teachers new to teaching than did public schools. However, it is difficult to establish to what extent this is a cause or an effect of higher turnover. Third, the effect of school size on turnover raises questions concerning the advantages and disadvantages of large schools, from the teachers' viewpoint. Research on school community holds that larger schools are less personal and more anonymous, but perhaps they also offer more job and mobility opportunities for teachers within the school and, as a result, have fewer teachers moving on for career reasons than smaller schools do. It may be true that from the student viewpoint, small and private schools offer a more favorable context for growth, but from the teacher viewpoint, this may be untrue.

Clearly, the relationships among school sector, school size, teacher experience, and teacher turnover warrant further investigation. A school-level analysis, such as that presented here, can only partially control for differences due to teacher demographic characteristics. Further research with multilevel data would be useful to examine whether the effects of teacher

characteristics on teacher turnover interact with those of school characteristics. For example, do the rates at which different types of teachers exit depend on the type of school in which they teach? Alternatively, do the rates of turnover in different types of schools depend on the types of teachers they employ?

Teacher professionalization is a second important issue in current education research. Over the past decade, a growing number of researchers have argued that improving schools requires professionalizing the job of teaching. As a result, a host of reforms have been promoted that are designed to upgrade the working conditions of teachers: teacher empowerment initiatives, merit pay plans, career ladders, mentoring programs, and other professional development plans (Holmes Group 1986; Carnegie Forum 1986; Sergiovanni and Moore 1989; Darling-Hammond 1984; Rosenholtz 1989). Ostensibly, such reforms would each promote teacher retention and decrease teacher turnover. This analysis examined the relationship between turnover and several examples of professional development programs and several aspects of working conditions. The results suggest that some programs and aspects of school working conditions are related to turnover and some are not.

Schools with more faculty influence over decisionmaking had distinctly lower rates of turnover than those with less faculty influence over decisionmaking. The strength of this relationship is particularly striking because the measure of faculty influence most likely suffers from some degree of measurement error (see discussion of variables in Technical Notes). These results are consistent with research advocating the benefits of teacher empowerment and related forms of school decentralization.

On the other hand, neither the provision of retraining and education support nor of mentoring programs in schools were related to the rate of teacher exits. Finally, merit pay plans were associated with increased turnover, but only in public schools, with a slight effect.[9] In each of these cases, the data indicate only whether a school had the program or not, suggesting that simply having these programs does not have a large impact on turnover. One possible implication is that the existence of reform programs may be less important, at least for turnover, than the type or quality of program. Clearly, further research is warranted on which kinds and types of teacher professionalization are beneficial and which are not.

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[9] See Ballou and Podgursky (1993) for a detailed review of the debate surrounding merit pay plans and an examination of SASS data on the prevalence of such programs.

4 Common Themes

This report has examined three topics: teacher supply, teacher qualifications and teacher turnover. Two themes have guided these analyses: the importance of examining differences across subgroups of teachers and schools; and the importance of examining the implications of the data for teacher and school quality. That is, the two key premises underlying this project have been, first, that supply, qualifications, and turnover vary among teachers and schools and, second, that these variations have distinct implications for teacher and school quality and effectiveness.

The analyses have shown that these phenomena often varied in unexpected ways and in ways often de-emphasized in education research. This section summarizes several common findings to have emerged from the different analyses.

School Sector: Public and Private

Each analysis has focused attention on distinct differences between public and private teachers and schools. These findings suggest that public and private school comparisons are both important and complex.

The public and private sectors are not of equal size. Seventy-six percent of the elementary and secondary schools in the United States are public, and 87 percent of elementary and secondary school teachers work in public schools.

Public and private schools differed in their sources of teacher supply. New hires in public schools were far more likely to come from inside the occupation, such as from other teaching jobs. New hires in private schools were more likely to come from outside the occupation, such as from noneducation jobs or from the ranks of parents and family caregivers (figure 1.1).

Public and private schools differed in their levels of faculty qualifications. In private schools, at the high school level, a smaller proportion of the faculty held regular state-approved teaching certificates than did public high school teachers, and a larger proportion were assigned to teach in fields for which they had little background schooling (tables 2.1 and 2.2). However, private schools greatly varied in their amounts of out-of-field teaching. Larger private high schools had among the lowest levels of out-of-field teaching of any schools. On the other hand, smaller private high schools had among the highest levels of out-of-field teaching of any schools.

Teachers in private schools reported they had higher levels of decisionmaking influence and lower levels of student discipline problems than did teachers in public schools. Teachers in private schools also received lower salaries and fewer paid benefits than public school teachers (table 3.1).

Private schools had higher rates of teacher turnover than did public schools. A larger proportion of private school teachers were new to teaching (table 3.1). Private school teachers were more likely than public school teachers to have left teaching for occupations outside of

education, while public school teachers were more likely to have left teaching for nonteaching jobs within education. Moreover, private school teachers were far more likely to have switched to public school jobs than were public school teachers to have switched to private school jobs. Finally, retirement accounted for far more of those who left public school jobs than of those who left private school jobs (figure 1.1).

Student Poverty Levels

The analyses each examined differences between public schools serving predominantly poverty-level student populations and those serving student populations with few poverty-level students. The former were those with 50 percent or more of the students receiving the federal free or reduced-price lunch program; the latter were those with less than 20 percent of the students receiving these lunches.

In some ways the education and training levels of faculty in poorer schools differed; in some ways, these did not. Public schools with a higher proportion of poverty-level students had a lower proportion of faculty with graduate degrees than did schools with a lower proportion of poverty-level students. But there was little difference in the proportion who had been formally trained in teaching methods and pedagogy. Teachers in higher poverty-level schools were not less likely to hold teaching certificates than teachers in other schools (table 2.2). But, in many fields, a larger proportion of teachers in poorer high schools were assigned to teach out of their fields of training than were teachers in less poor high schools (tables 2.2 and 2.4 and figure 2.2). Finally, higher poverty schools surprisingly did not have appreciably higher teacher turnover rates (table 3.3).

School Size: Large and Small

The analyses each focused attention on distinct differences between smaller and larger schools. These findings raise questions about the relative advantages and disadvantages of schools of different sizes.

School size and sector were related. Eighty-one percent of private schools were small (fewer than 300 students), while only 5 percent were large (600 or more students). On the other hand, 31 percent of public schools were small, while 28 percent were large.

Smaller public and private schools at the high school level differed from larger schools in the education level of their teachers. At the high school level, about one-third of teachers in small public and private schools held graduate degrees; over half did in large public and private schools. Teachers in small private schools were less likely to hold teaching certificates than teachers in large private schools. A far larger proportion of teachers in small high schools, both public and private, were assigned to teach out of their fields of training than were teachers in large high schools (table 2.2 and figure 2.3). Finally, a larger proportion of teachers in small schools, both public and private, moved from or left their schools than in large schools (figure 3.2).

Teaching Experience: New and Experienced

The analyses focused attention on distinct differences between new teachers and those with experience. The findings suggest that seniority was a major factor in how teachers were treated and how their work was organized.

Teachers cumulate teaching experience on two levels: total occupational experience and experience at a particular school. In this analysis, "beginning teachers" refers to those who had less than 3 years total teaching experience. On average, 14 percent of school faculties were comprised of beginners. On the other hand, in this analysis, "recently hired teachers" refers to those who had less than 3 years experience in their present school. At the high school level, 25 percent of all teachers were recently hired.

Recently hired teachers had lower education levels than more experienced teachers at the high school level. Recently hired teachers, in both public and private schools, were less likely to have obtained graduate degrees and less likely to have obtained teaching certificates than were more experienced teachers (table 2.1). However, the recently hired, in both public and private schools, were also more likely to be assigned to teach out of their fields of training than were more experienced teachers (table 2.1 and figure 2.1).

This report has focused on levels of teacher supply, teacher qualifications, and teacher turnover. It has not focused on either the causes or the consequences of these levels. It has not, for instance, sought to explain why schools have high levels of out-of-field teaching or high levels of turnover or to examine the impact and effects of these levels. However, the common findings, summarized above, on school sector, school poverty level, school size, and teacher experience that have emerged from the analyses raise important questions for education research on the causes and consequences of problems of teacher supply, teacher qualifications, and teacher turnover. For example, what effects do different levels of faculty education, of out-of-field teaching, and of teacher turnover have on the performance and commitment of teachers? What impact do they have on school success? How do they directly or indirectly affect the behavior and attitudes of students? These questions all warrant further research.

Technical Notes

The Schools and Staffing Survey

The primary data source for this report is the 1990-91 Schools and Staffing Survey (SASS), a nationally representative survey of teachers, principals, and schools conducted by the U.S. Department of Education's National Center for Education Statistics (NCES). The U.S. Census Bureau collected the SASS data for NCES in 1991 using a mail survey with telephone follow up. The objective of SASS was to obtain information on the staffing, occupational, and organizational characteristics of schools in the United States.

Sample Selection[10]

Schools were the primary sampling unit for SASS. Each selected school received a school questionnaire and an administrator questionnaire. Next, a sample of teachers was selected within each school, and each received a teacher questionnaire. A Teacher Demand and Shortage (TDS) questionnaire was sent to the local education agency (LEA) associated with each public selected school. Also, an additional sample of public school districts not associated with the sampled schools received the TDS questionnaire. The private school questionnaire included TDS questions for the school. The sample for the SASS conducted during the 1990-91 school year included 12,856 schools and administrators, 62,217 teachers, and 5,515 local education agencies.

SASS was designed to provide national estimates for public and private schools; state estimates for public schools; state elementary, state secondary, and national combined estimates for public schools; affiliation- and grade-level estimates for private schools; estimates of change from 1988 to 1991 in school-level characteristics; and national estimates for schools with greater than 25 percent Indian enrollment. The teacher survey was designed to support comparisons between new and experienced teachers. Comparisons between bilingual and nonbilingual teachers are possible at the national level.

Selection of Schools

The public school sample of 9,586 schools was selected primarily from the 1988-89 school year Common Core of Data (CCD) file. The CCD is based on survey data collected annually by NCES from all state education agencies and is believed to be the most complete list of public schools available. The frame includes regular public schools, Department of Defense operated military base schools, and nonregular schools such as special education, vocational, and alternative schools.

The private school sample of 3,270 schools was selected primarily from the 1989-90 Private School Survey (PSS) list frame, which was based on the 1989 Quality of Education Data

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[10] For a detailed description of the sample design of the 1990-91 SASS, see Kaufman and Huang 1993.

(QED) private school list, updated with 20 private school association lists provided to the Census Bureau in the spring of 1989.

To improve private school coverage, an area frame of schools was developed consisting of 123 sampling units (PSUs) selected with probability proportional to the square root of the PSU population. Within each PSU, a telephone search was conducted to find all in-scope private schools. Sources included yellow pages, religious institutions (except for Roman Catholic religious institutions, because each Catholic diocese is contacted annually when the QED list is updated), local education agencies, chambers of commerce, and local government offices. PSU schools not on the QED file nor the lists from private school associations were listed in the area school frame. From the frame, additional schools were eligible to be selected for the SASS private school sample.

The private school sample was designed to support estimates at the national and affiliation levels. The affiliation groups for private schools were determined by the school's orientation or affiliation group listed on the 1988-89 Private Schools Survey (the frame).

Selection of LEAs

All LEAs that had at least one school selected for the school sample were included in the LEA sample for the TDS Survey. Each Bureau of Indian Affairs and Department of Defense school was defined to be an LEA. Some LEAs did not have schools but hired teachers who taught in schools in other LEAs. To ensure representation of these teachers, a sample of 135 LEAs without eligible schools was selected. Only 14 of the 135 were actually in scope (that is, were an operating public school agency that reported hiring teachers). All LEAs in Delaware, Nevada, and West Virginia were included to reduce high standard errors in these states. The total LEA sample was 5,515.

Selection of Teachers

All 56,051 public and 9,166 private school teachers in the teacher samples were selected from the sampled public and private schools. The average number of teachers selected per school was 3.49, 6.98, and 5.23 teachers for public elementary, secondary, and combined schools, respectively, and 3.78, 4.72, and 2.83 teachers for private elementary, secondary, and combined schools, respectively.

Data Collection

The data were collected for NCES by the U.S. Bureau of the Census. Questionnaires were mailed to school districts and administrators in December 1990 and to schools and teachers in January and February 1991.[11] Six weeks later, a second questionnaire was sent to each nonrespondent. A telephone follow-up of nonrespondents was conducted between March and June.

Weighting

Weights of the sample units were developed to produce national and state estimates for public schools, teachers, administrators, and LEAs. The private-sector data were weighted to produce national estimates and affiliation-group estimates. The basic weights were the inverse of the probability of selection, and were adjusted for nonresponse and also to adjust the sample totals (based on responding, nonresponding, and out-of-scope cases) to the frame totals in order to reduce sampling variability.

Response Rates and Imputation

The final weighted questionnaire response rates were as follows:

	Public	Private
SASS:		
Teacher Demand and Shortage	93.5	—
Administrator	96.7	90.0
School	95.3	83.9
Teacher*	90.3	84.3
TFS:		
Former Teachers	92.4	94.1
Current Teachers	97.4	96.2

— not applicable

*The response rates for public school teachers do not include the 5 percent of the public schools that did not provide teacher lists, and the response rates for private school teachers do not include the 11 percent of the private schools that did not provide teacher lists. The effective response rate for public schools was 85.8 percent and for private schools, 75.9 percent.

Values were imputed for items with missing data by: (1) using data from other items on the questionnaire or a related component of the SASS (a school record to impute district data, for

[11] Copies of the questionnaires may be obtained by writing to the Schools and Staffing Survey staff of NCES at the address given at the end of this section.

example); (2) extracting data from the sample file, such as the CCD or PSS; or (3) extracting data from a respondent with similar characteristics.[12]

Standard Errors

The data in this report are based on samples and, hence, are subject to sampling variability. In order to make proper inferences about the larger population which the samples represent, the accuracy of all statistics and estimates in this report were checked. All comparisons discussed in the text were tested for statistical significance using the student's t statistic at an alpha level of .05. Whenever comparisons were multiple, the Bonferroni procedure was used to adjust the alpha level for the t tests.

Standard errors were calculated to indicate the accuracy of each estimate in the tables. If all possible samples of the same size were surveyed under the same conditions, an interval of 1.96 standard error units below to 1.96 standard error units above a particular statistic would include the universe value in approximately 95 percent of the cases. Note, however, that the standard errors do not take into account the effect of biases due to item nonresponse, measurement error, data processing error, or other possible systematic error.

Standard errors were calculated using a balanced repeated replications procedure. Because this procedure incorporates the design features of complex sample surveys, the standard errors are generally higher than those calculated under the assumptions of simple random sampling. Standard errors for selected tables are presented in the Appendix.

Variable Definitions

Teachers

Minority: Asian, American Indian, Alaskan Native, Hispanic, Black

New Hire: less than 1 year experience in the current school

Recent Hire: less than 3 years experience in the current school (including part time and full time)

Beginning: less than 3 years total teaching experience (including part time and full time)

Schools

Elementary: a school that had grade 6 or lower, or "ungraded" and no grade higher than 8.

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[12] For a detailed description of the imputation procedures in the 1990-91 SASS, see Kaufman and Huang 1993, 60-87.

Combined: a school that had grades higher than eighth and lower than seventh

Secondary: a school that had no grade lower than 7, or "ungraded" and had grade 7 or higher

Central City: a large central city (a central city of a Standard Metropolitan Statistical Area (SMSA) with population greater than or equal to 400,000 or a population density greater than or equal to 6,000 per square mile) or a mid-size central city (a central city of an SMSA, but not designated as a large central city).

Urban Fringe/Large Town: Urban fringe of a large or mid-size city (a place within an SMSA of a large or mid-size central city and defined as urban by the U.S. Bureau of the Census) or a large town (a place not within an SMSA, but with a population greater than or equal to 25,000 and defined as urban by the U.S. Bureau of the Census).

Rural/Small Town: Rural area (a place with a population of less than 2,500 and defined as rural by the U.S. Bureau of the Census) or a small town (a place not within an SMSA, with a population of less than 25,000 but greater than or equal to 2,500, and defined as urban by the U.S. Bureau of the Census).

Free-Lunch Recipients: the proportion of a school's student population that was receiving the federal free or reduced-price lunch program, sponsored by the federal Department of Agriculture. Free-lunch recipients is a standard measure of poverty level in school populations because almost all public schools participate in the program. However, it must be interpreted with some caution. The number of children reported to be recipients may be an underestimate, because not all children who are eligible may choose to receive these lunches (especially at the secondary level). Note that this measure of student poverty level was not available for private schools.

Students

Students of teachers with no major/minor in assignments: This is a measure of the percentage of students enrolled in classes in each field who were taught by teachers who did not have at least a minor in that field. This measure must be interpreted with some caution because the class enrollment figures for students were not necessarily a representative sample of students; the teachers assigned to the classes were the representative sample in SASS (students could, for instance, be counted more than once in separate class periods taught by different teachers).

Measures of School Working Conditions for Analysis of Teacher Turnover (Chapter 3)

The analysis of teacher turnover utilized two composite indices of school working conditions—Faculty Influence and Student Discipline Problems—based on teachers' reports of working conditions within their schools. Construction of these composite indices involved several steps:

1. School means were calculated for all SASS Teacher Questionnaire items concerned with school working conditions that were relevant to teacher turnover.

2. Factor analysis (with varimax rotation method) was utilized to group the items. Item loadings of .4 were considered necessary for inclusion in a factor. This analysis yielded 6 factors: violent student behavior; student self-abusive behavior; administrative leadership; teachers' classroom control; teachers' influence over school policy; student family problems.

3. Because the factors were highly intercorrelated, the bivariate correlation of each with teacher turnover was reviewed. Only those with at least moderate correlations were selected: violent student behavior; student self-abusive behavior; teachers' classroom control; teachers' influence over policy. These, in turn, were combined into two composite indices: faculty influence and student discipline problems.

4. Means of the school means of the questionnaire items comprising each composite index were then calculated. Because high scores for some questionnaire items used in the indices represented the existence of problems and for others the opposite, the latter were first reverse coded in order to be consistent.

The final indices were:

Faculty influence: 10 items (TSC244 to TSC253): influence and control over the following school policies and classroom issues: establishing curriculum; selecting textbooks and other instructional materials; selecting content, topics, and skills to be taught; selecting teaching techniques; determining the amount of homework to be assigned; setting policy on grouping students in classes by ability; determining discipline policy; disciplining students in classrooms; and evaluating and grading students.

Student discipline problems: 12 items (TSC258-TSC269): physical conflicts among students; robbery; vandalism; pregnancy; use of alcohol; drug abuse; weapon possession; physical abuse of teachers; verbal abuse of teachers; disrespect; dropping out; apathy.

There are several reasons why these measures must be interpreted with some caution in the analysis.

In these measures, teacher/respondents are treated as informants of workplace and organizational conditions in their schools. In essence, these measures assess the characteristics of schools indirectly, by aggregating members' perceptions of these organizations. Use of employee

respondent perceptions to construct such variables is standard practice in both research on school organization and in research on organizations in general (e.g., Pallas 1988; Lee et al. 1991; Rowan et al. 1991). Indeed, the argument is often made that members and employees are in the best position to know what these conditions are. Nevertheless, it is important to acknowledge several limitations to such measures.

The sample of teachers within each school is random and hence representative. But it is not large. The mean teacher sample size was from four to six teachers from each school, depending on level and sector. It is unclear to what extent within-school teacher sample size affects the representativeness of the measures.

Moreover, there are the related questions of reliability and validity. Because such data represent members' perceptions of school conditions, these responses are, by definition, subjective attributions. It is to be expected that different individuals will experience their schools differently and hence, vary in their reports. The turnover investigation does not assume that schools are uniform entities, but its focus is the collective properties of schools as organizations. The objective of the analysis is to examine between-school differences and not to focus on within-school diversity.

Definitions of Fields for Analysis of the Supply of Qualified Teachers (Chapter 2)

Field	Teacher Training (Major/Minor)	Teaching Assignments
art/music	art, fine & applied art education drama/theater music music education	arts and crafts filmmaking/photography chorus band drama/theater/dance music other visual
physical education	health profession physical education/health	health physical education
foreign language	foreign language educ. French German Latin Russian Spanish other foreign language	French German Latin Russian Spanish Other foreign language
vocational education	agric., natural res. agriculture education architecture & environmental design business & management business, commerce & distributive education communication & journalism engineering health profession home economics home economics education industrial arts health/physical education	agriculture business, marketing industrial arts health occupation vocational home economics trade and industry technical accounting/bookkeeping shorthand typing career education other vocational education
social studies	psychology public affairs & services social studies/social science education economics history political science sociology other social sciences other area, ethnic studies	social studies history world civilization political science/government geography economics civics sociology/social organization other social science psychology
science	science education biology chemistry earth science/geology physics other natural sciences	general science biology/life science chemistry physics geology/earth science/space science other physical science other natural science

Field	Teacher Training (Major/Minor)	Teaching Assignments
English	communic & journalism English/language arts English education literature reading education	literature composition/journalism/creative writing reading other English/language arts course
mathematics	engineering mathematics mathematics education	general mathematics business math algebra, elementary algebra, intermediate algebra, advanced geometry, plane/solid trigonometry analytical geometry probability/statistics calculus other mathematics

Comments and More Information

SASS and TFS data tapes, survey questionnaires, and user's manuals are available from NCES at the address listed below. For an extensive report, summarizing the data used in this investigation and providing an overview of SASS, see *Schools and Staffing in the United States: A Statistical Profile, 1990-91* (Choy et al. 1993b).

Schools and Staffing Survey
Elementary and Secondary Education Statistics Division
National Center for Education Statistics
555 New Jersey Avenue, NW
Washington, DC 20208-5653

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APPENDIX

STANDARD ERRORS FOR SELECTED TABLES

Table A.1— Standard errors for table 2.1: Number of high school teachers, percentage of teachers, by highest degree earned, percentage of teachers certified, and average percentage of teacher's class schedule without at least a minor, by selected *teacher* characteristics: 1990-91

	Less than Bachelor's	Bachelor's	Master's or More	Certification	Class schedule with no major/minor
Total Overall	0.1	0.6	0.6		0.4
Public	0.1	0.6	0.6		0.4
Sex					
Male	0.2	0.8	0.8	.24	0.5
Female	0.1	0.7	0.7	.26	0.5
Race					
Minority	0.3	1.8	1.8	.66	1.3
White	0.1	0.6	0.6	.18	0.4
Experience					
Experienced	0.1	0.6	0.7	.15	0.5
New hire	0.2	1.1	1.1	.71	0.6
Status					
Part time	0.2	1.9	1.9	1.1	1.2
Full time	0.1	0.6	0.6	.19	0.4
Private	0.5	1.5	1.5		1.3
Sex					
Male	0.6	2.1	2.3	1.7	1.6
Female	0.7	1.8	1.7	1.9	1.8
Race					
Minority	2.8	4.7	3.9	5.5	4.0
White	0.5	1.6	1.6	1.4	1.3
Experience					
Experienced	0.6	1.9	1.8	1.9	1.2
New hire	0.8	2.0	2.0	2.0	2.8
Status					
Part time	1.8	4.2	3.9	4.2	3.6
Full time	0.5	1.6	1.5	1.5	1.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire)

Table A.2— Standard errors for table 2.3: Percentage of high school teachers who taught one or more classes in a field without at least a minor in that field, by field and selected *teacher* characteristics: 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/Music	Phys. Ed.
Overall	1.1	0.9	0.8	1.1	1.2	0.8	1.2	1.6
Public	1.1	0.8	0.8	1.0	1.1	0.8	1.2	1.6
Sex								
Male	1.5	0.9	1.0	2.4	2.5	1.2	2.0	2.2
Female	1.8	1.7	1.7	1.1	1.6	1.1	1.2	1.5
Race								
Minority	4.2	2.6	3.0	5.5	3.1	3.0	2.4	10.0
White	1.1	0.9	0.8	0.9	1.3	0.9	1.2	1.0
Experience								
Experienced	1.6	0.9	0.9	1.2	1.4	1.0	1.1	1.8
New hire	2.4	2.4	1.9	1.8	2.4	1.7	2.8	2.4
Status								
Part time	4.8	5.3	4.7	3.7	3.0	3.6	0.8	5.1
Full time	1.2	0.8	0.8	1.1	1.4	0.9	1.4	1.6
Private	2.6	3.7	3.3	3.7	3.5	5.5	4.2	4.8
Sex								
Male	3.3	5.2	5.0	6.9	8.1	9.2	6.6	7.7
Female	4.0	5.1	5.9	4.1	3.1	6.2	6.4	6.9
Race								
Minority	10.8	12.8	-	13.1	5.2	-	-	-
White	2.7	3.9	3.5	3.8	4.1	5.4	4.6	4.9
Experience								
Experienced	3.7	4.5	4.5	3.1	4.3	6.5	5.5	6.3
New hire	5.3	5.7	6.1	6.3	5.6	7.7	6.1	7.1
Status								
Part time	10.7	10.1	11.3	8.8	9.3	-	10.4	-
Full time	3.0	4.0	4.2	3.7	3.9	6.4	5.5	4.9

- Too few cases for reliable estimate

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher Questionnaire).

Table A.3— Standard errors for table 2.4: Percentage of high school teachers who taught one or more classes in a field without at least a minor in that field, by field and selected *school* characteristics: 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/ Music	Phys. Ed.
Overall	1.1	0.9	0.8	1.1	1.2	0.8	1.2	1.6
Public	1.1	0.8	0.8	1.0	1.1	0.8	1.2	1.6
Size								
Less than 300	3.2	2.8	2.1	2.1	3.6	1.6	3.7	2.7
300-599	4.0	2.4	2.3	3.6	2.8	1.5	1.7	6.1
600 or more	1.2	1.1	0.8	0.9	1.3	1.1	1.5	1.2
Community								
Rural/sm. town	1.2	1.3	1.1	1.5	1.7	1.1	2.0	1.5
Urban fringe/lg. town	2.7	1.8	1.5	2.3	2.0	1.9	2.0	4.0
Central city	2.6	1.8	1.8	1.7	2.7	1.8	2.2	2.2
Minority Enrollment								
Less than 20%	1.5	1.1	1.1	1.2	1.2	1.0	1.7	1.1
20% or more	2.0	1.6	1.4	1.7	2.0	1.3	1.6	3.1
Free-Lunch Recipients								
Less than 20%	1.3	1.0	1.0	1.0	1.2	1.2	1.5	1.3
20-49%	2.0	1.8	2.1	1.8	2.8	1.4	2.0	2.0
50% or more	5.0	2.5	2.9	5.1	4.4	2.1	4.7	8.1
Private	2.6	3.7	3.3	3.7	3.5	5.5	4.2	4.8
Size								
Less than 300	4.5	6.1	5.9	5.6	7.0	8.4	6.3	8.0
300-599	5.5	5.2	5.9	4.2	4.8	10.5	7.4	11.2
600 or more	3.6	3.5	5.3	4.5	4.4	-	10.6	6.8
Community								
Rural/sm. town	8.2	10.1	9.2	9.5	8.2	12.8	8.5	12.2
Urban fringe/lg. town	4.9	5.0	5.6	5.0	7.6	13.7	7.6	8.3
Central city	3.9	6.1	5.3	5.3	3.3	6.7	6.2	7.5
Minority Enrollment								
Less than 20%	3.3	4.8	4.7	4.0	3.8	6.8	5.8	5.3
20% or more	4.8	4.7	5.1	4.2	6.5	8.4	8.0	10.2
Orientation								
Catholic	4.1	5.6	5.2	3.8	3.2	7.5	7.8	8.7
Other religious	5.5	7.2	7.0	6.0	8.0	9.2	7.8	9.4
Nonsectarian	5.7	6.4	5.1	6.1	3.7	-	3.9	8.7

- Too few cases for reliable estimate

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

Table A.4— Standard errors for table 2.5: Percentage of *public* high school teachers who taught one or more classes in a field without at least a minor in that field, by field and *state:* 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/Music	Phys. Ed.
Overall	1.1	0.8	0.8	1.0	1.1	0.8	1.2	1.6
Alabama	5.7	3.5	4.0	3.8	-	3.5	10.5	3.6
Alaska	5.4	6.9	6.8	6.1	-	9.1	-	7.9
Arizona	3.8	5.0	6.1	4.9	-	4.8	6.5	9.6
Arkansas	3.8	4.4	5.0	4.8	-	4.3	3.3	4.5
California	5.4	4.7	3.5	5.9	-	6.6	6.7	8.6
Colorado	5.7	3.9	4.9	3.9	5.3	4.9	5.1	3.8
Connecticut	4.4	3.4	6.6	4.9	0.0	7.5	-	-
Delaware	-	-	-	-	-	-	-	-
District of Columbia	-	-	-	-	-	-	-	-
Florida	10.0	8.7	5.7	3.7	-	-	9.6	7.2
Georgia	5.1	5.4	4.9	4.5	9.2	3.9	-	8.5
Hawaii	13.2	-	-	-	-	-	-	-
Idaho	5.4	3.2	4.4	5.2	-	4.8	4.6	4.2
Illinois	6.7	4.0	6.5	5.3	3.9	4.4	4.1	2.7
Indiana	6.5	5.0	3.1	4.1	11.4	3.4	4.6	5.0
Iowa	5.3	8.4	3.8	4.9	9.7	2.8	5.0	8.4
Kansas	7.1	5.8	5.5	5.5	-	3.6	2.7	5.1
Kentucky	4.8	5.7	4.8	5.4	-	4.3	7.1	-
Louisiana	5.5	6.5	6.2	4.1	-	3.6	-	5.3
Maine	5.2	4.2	4.8	8.5	-	3.8	6.7	-
Maryland	5.9	7.0	4.2	5.1	-	6.0	-	-
Massachusetts	4.9	5.2	5.7	4.2	5.3	6.8	-	-
Michigan	6.1	6.5	5.6	4.6	-	4.2	6.8	5.0
Minnesota	3.7	4.6	4.2	2.9	5.4	2.5	3.7	6.2
Mississippi	4.1	3.4	3.9	3.4	-	4.5	4.7	6.7
Missouri	5.2	7.7	3.5	4.6	9.0	3.1	5.3	6.0
Montana	3.4	5.8	4.8	2.9	7.6	3.1	5.4	3.4
Nebraska	5.1	4.0	6.0	4.0	-	2.7	4.3	5.0
Nevada	8.1	-	9.9	6.1	-	8.7	-	-
New Hampshire	-	-	-	2.4	-	-	-	-
New Jersey	6.3	6.7	4.4	6.2	5.2	4.2	6.1	6.7
New Mexico	5.8	8.6	3.7	6.6	-	5.7	-	6.8
New York	3.9	3.9	4.1	5.6	3.9	3.5	7.0	3.1
North Carolina	5.4	3.7	5.2	5.6	-	3.7	6.4	7.1
North Dakota	3.8	2.7	3.8	2.9	6.3	2.4	3.5	3.8
Ohio	4.0	4.2	5.6	3.1	-	4.6	4.7	-
Oklahoma	4.3	4.5	3.7	3.8	8.7	2.1	6.8	5.2
Oregon	5.2	4.2	4.9	5.3	-	3.5	6.8	6.7
Pennsylvania	5.9	3.8	4.3	4.7	4.6	3.7	7.0	2.9
Rhode Island	-	-	-	-	-	-	-	-
South Carolina	8.1	6.2	4.5	3.8	-	5.3	5.9	8.7
South Dakota	3.4	3.7	3.3	4.6	5.5	2.5	3.7	8.1
Tennessee	6.5	5.5	4.6	4.6	6.7	5.3	6.3	6.4
Texas	4.7	4.4	3.5	3.0	6.7	3.7	5.1	3.0
Utah	5.2	4.5	5.5	3.9	7.8	3.9	5.6	4.3
Vermont	-	-	-	7.8	-	-	-	-
Virginia	5.3	5.0	5.2	4.0	1.9	3.6	6.0	-
Washington	6.6	5.5	4.1	3.7	4.0	4.2	6.6	6.6
West Virginia	4.3	5.2	6.0	5.7	-	4.2	6.7	3.7
Wisconsin	4.2	4.7	3.0	6.0	-	2.6	3.8	2.5
Wyoming	7.1	3.1	7.7	4.8	-	4.2	6.1	4.0

- Too few cases for a reliable estimate

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

Table A.5— Standard errors for table 2.6: Percentage of high school *students* enrolled in classes taught by teachers without at least a minor in the field, by field and selected *school* characteristics: 1990-91

	Math	Science	Social Studies	English	Forgn. Lang.	Voc. Ed.	Art/Music	Phys. Ed.
Overall	1.0	0.8	0.7	0.8	1.2	1.1	0.7	0.9
Public	1.1	0.8	0.7	0.7	1.3	1.1	0.7	0.6
Size								
Less than 300	3.8	3.5	1.8	1.7	4.0	1.9	1.4	1.6
300-599	3.6	1.7	2.5	2.5	2.9	1.4	0.7	2.0
600 or more	1.3	0.8	0.7	0.8	1.4	1.5	1.1	0.8
Community								
Rural/sm. town	1.1	1.1	1.1	1.2	1.9	1.5	1.0	0.9
Urban fringe/lg. town	2.3	1.4	1.4	1.1	1.9	2.3	1.6	1.3
Central city	2.5	1.6	1.2	1.8	2.5	2.3	1.9	1.5
Minority Enrollment								
Less than 20%	1.2	1.1	0.8	1.0	1.3	1.2	0.8	0.8
20% or more	1.8	1.3	1.2	1.4	2.2	1.9	1.5	1.3
Free-Lunch Recipients								
Less than 20%	1.4	0.7	0.8	0.9	1.2	1.5	1.0	0.8
20-49%	2.3	1.6	1.8	1.5	3.7	1.9	1.2	1.5
50% or more	3.7	3.1	1.8	3.3	4.2	2.5	2.1	3.4
Private	2.8	3.7	3.2	3.0	2.8	6.2	2.9	5.1
Size								
Less than 300	5.6	6.1	6.7	7.0	6.0	10.2	5.3	11.3
300-599	5.9	2.9	6.9	3.7	3.3	15.5	5.1	8.4
600 or more	4.5	3.6	3.6	4.4	4.2	8.2	8.7	7.0
Community								
Rural/sm. town	7.7	9.2	10.4	10.6	5.9	13.1	10.4	19.9
Urban fringe/lg. town	4.3	2.5	3.0	3.2	5.3	14.4	5.3	5.4
Central city	4.1	4.8	4.5	5.2	3.4	9.6	5.8	7.1
Minority Enrollment								
Less than 20%	3.7	3.6	4.1	3.8	3.2	8.6	3.4	6.0
20% or more	5.1	4.0	5.6	3.5	5.6	9.6	9.2	9.6
Orientation								
Catholic	4.5	3.5	4.3	3.7	3.3	7.0	7.0	8.2
Other Religious	6.2	6.4	6.1	7.1	9.3	12.0	5.5	11.9
Nonsectarian	5.3	5.3	6.2	5.4	3.1	14.9	1.6	7.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (Teacher and School Questionnaires).

Table A.6— Standard errors for table 3.4: Mean teacher turnover in *public* schools, by state: 1990-91

	% Teacher Turnover
Alabama	0.7
Alaska	3.2
Arizona	1.6
Arkansas	0.6
California	1.0
Colorado	0.8
Connecticut	0.7
Delaware	1.2
District of Columbia	0.8
Florida	0.7
Georgia	0.8
Hawaii	0.8
Idaho	1.1
Illinois	0.7
Indiana	0.4
Iowa	0.6
Kansas	1.0
Kentucky	0.6
Louisiana	0.9
Maine	0.8
Maryland	0.8
Massachusetts	1.7
Michigan	0.5
Minnesota	0.7
Mississippi	0.6
Missouri	0.6
Montana	0.8
Nebraska	3.1
Nevada	1.1
New Hampshire	0.9
New Jersey	0.6
New Mexico	1.3
New York	0.7
North Carolina	0.8
North Dakota	1.0
Ohio	0.8
Oklahoma	0.8
Oregon	1.2
Pennsylvania	0.7
Rhode Island	1.4
South Carolina	0.8
South Dakota	1.1
Tennessee	0.7
Texas	0.6
Utah	0.8
Vermont	1.3
Virginia	1.0
Washington	0.8
West Virginia	1.4
Wisconsin	0.5
Wyoming	1.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1990-91 Schools and Staffing Survey (School Questionnaire).

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